CANADIAN MACHINERY AND MANUFACTURING NEWS

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FORD-SMITH

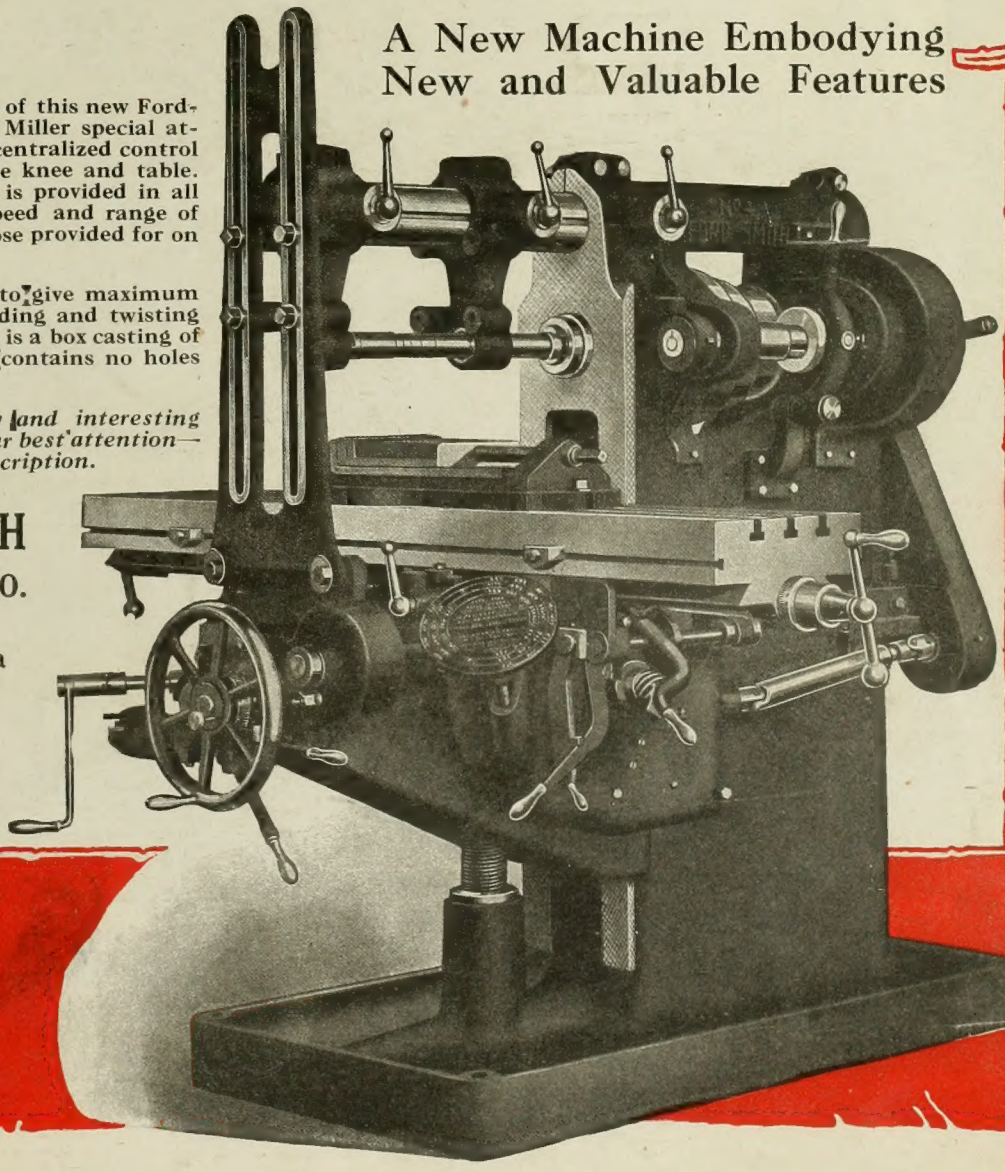
NO. 4 PLAIN MILLER

A New Machine Embodying New and Valuable Features

IN the construction of this new Ford-Smith No. 4 Plain Miller special attention is given to centralized control of all movements of the knee and table. Rapid power traverse is provided in all directions and the speed and range of coarse feeds equal those provided for on geared millers.

The knee is designed to give maximum rigidity under the bending and twisting stress of the cutter; it is a box casting of the solid top type and contains no holes at the top or sides.

There are other new and interesting features worthy of your best attention—write for complete description.



FORD-SMITH MACHINE Co.
LIMITED
Hamilton, Canada

Foreign Agents:
W. E. STOREY
London, England

All the Fine Qualities That Good Work Demands

Pratt & Whitney Small Tools enjoy an enviable reputation for excellence that has been well earned in the high production shops of the country. Where stamina as well as exceptional accuracy and precision are required P & W Tools have more than held their own. Our line is complete. It includes taps, dies, milling cutters, reamers, punches, drills, etc., both of standard and special design and in sizes to suit every requirement.

Prompt service is assured at our nearest store, where P & W Small Tools are carried in stock for immediate delivery.

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VANCOUVER
B.C. Equipment Co.

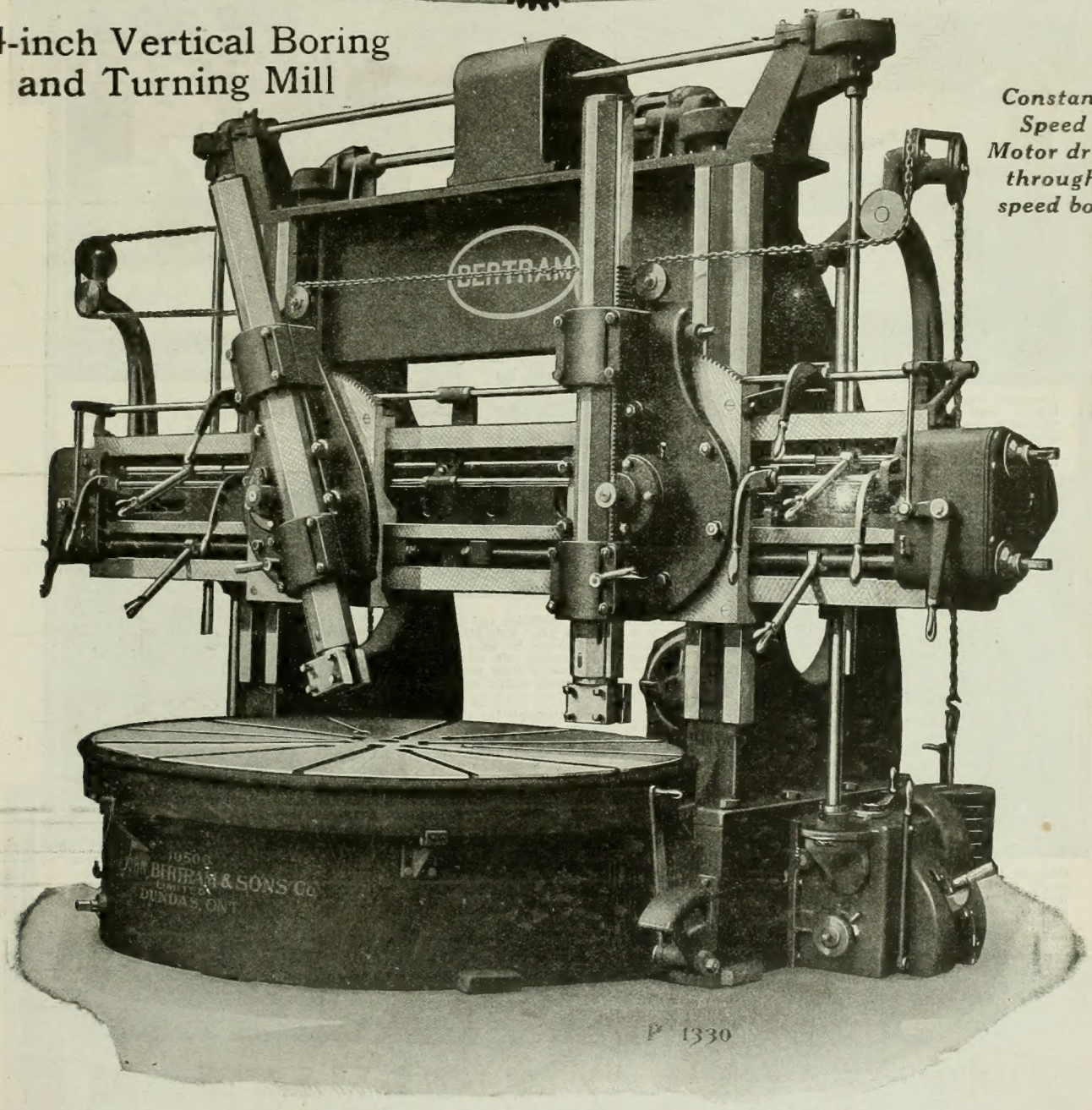
HALIFAX
Roy Building

The BERTRAM Page

MACHINE TOOLS

84-inch Vertical Boring and Turning Mill

Constant Speed Motor drive through speed box



The John Bertram & Sons Co., Limited

DUNDAS, ONTARIO, CANADA

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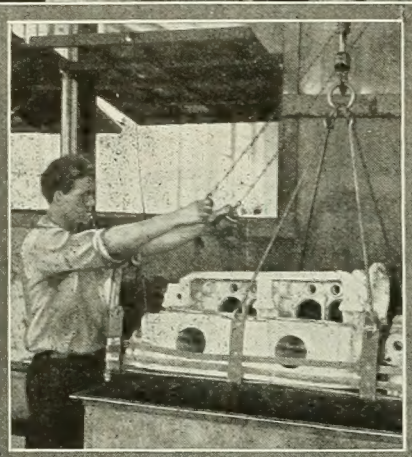
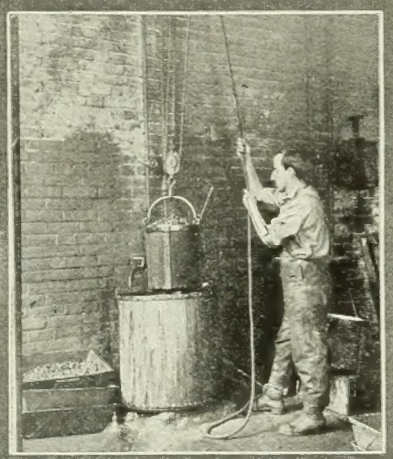
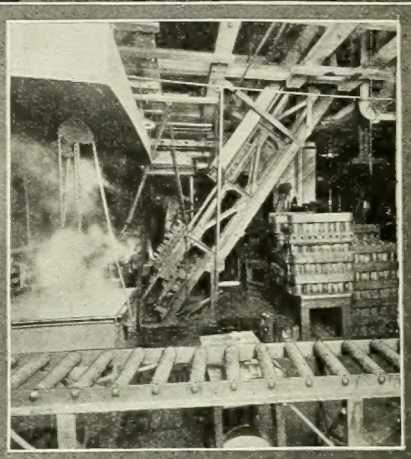
Clean Metal Surfaces Pay Big Dividends-



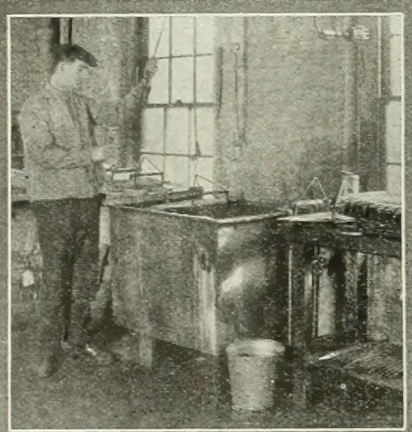
Aluminum crank cases made a ticklish cleaning job until Oakite arrived on the scene. The flaky appearance that resulted when an alkali cleaner was used, was at once eliminated and reports show better, quicker cleaning at lower cost.



No trouble to clean these large truck chassis parts. Illustration shows tank filled with Oakite cleaning solution and two or three dips made the metal surfaces chemically clean.



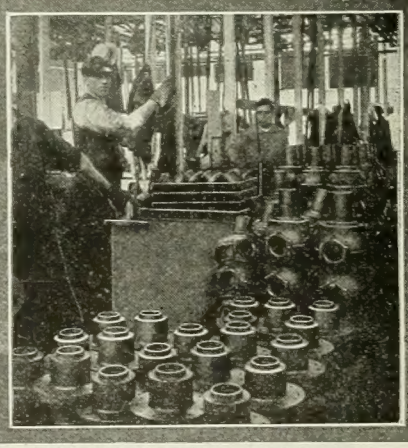
Another of the many motor car plants that find it economical to use Oakite materials for cleaning metal parts. Here is shown the Oakite tank wherein oil and grease is removed from cylinder blocks.



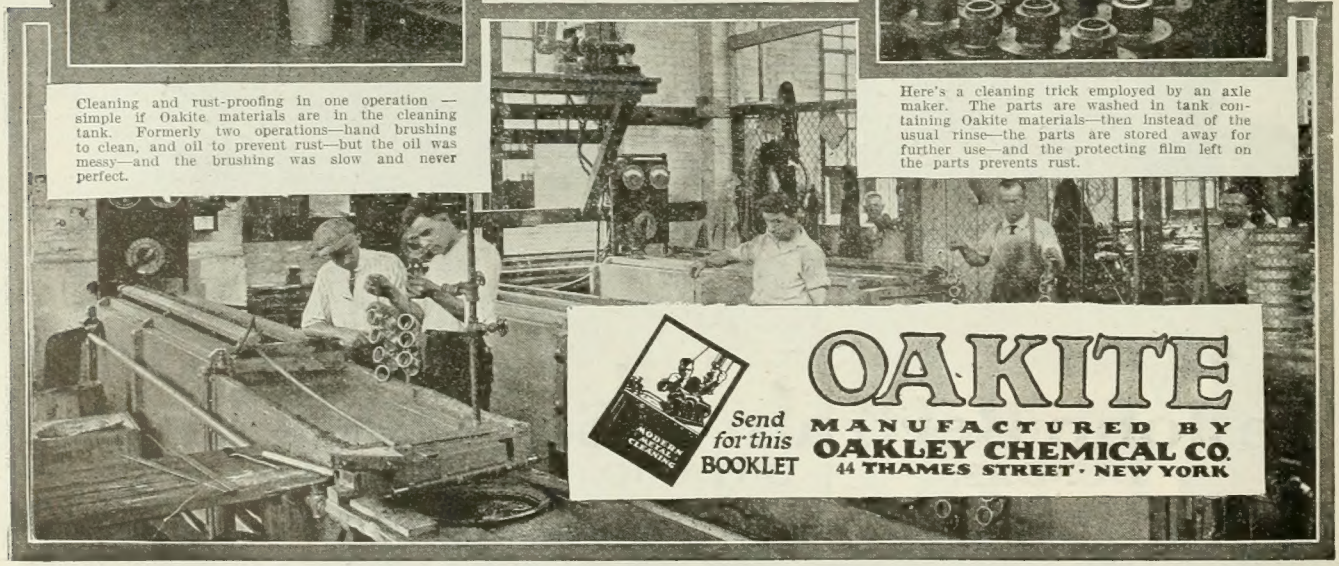
Cleaning and rust-proofing in one operation — simple if Oakite materials are in the cleaning tank. Formerly two operations—hand brushing to clean, and oil to prevent rust—but the oil was messy—and the brushing was slow and never perfect.

Above: The removal of tempering and quenching oils is a man size job. This plant gets 100 per cent. clean surface by using Oakite for removing long standing oil from heat treated taper rolls. Two or three plunges of basket in tank filled with Oakite solution—and the job's done.

Below: Cleaning and electroplating the base metal in one operation is a favorite stunt in plating shops that use Oakite Platers' Cleaner. This plating department secured 100 per cent. perfect plating results on automobile parts.



Here's a cleaning trick employed by an axle maker. The parts are washed in tank containing Oakite materials—then instead of the usual rinse—the parts are stored away for further use—and the protecting film left on the parts prevents rust.



Send for this BOOKLET

OAKITE

MANUFACTURED BY

OAKLEY CHEMICAL CO.

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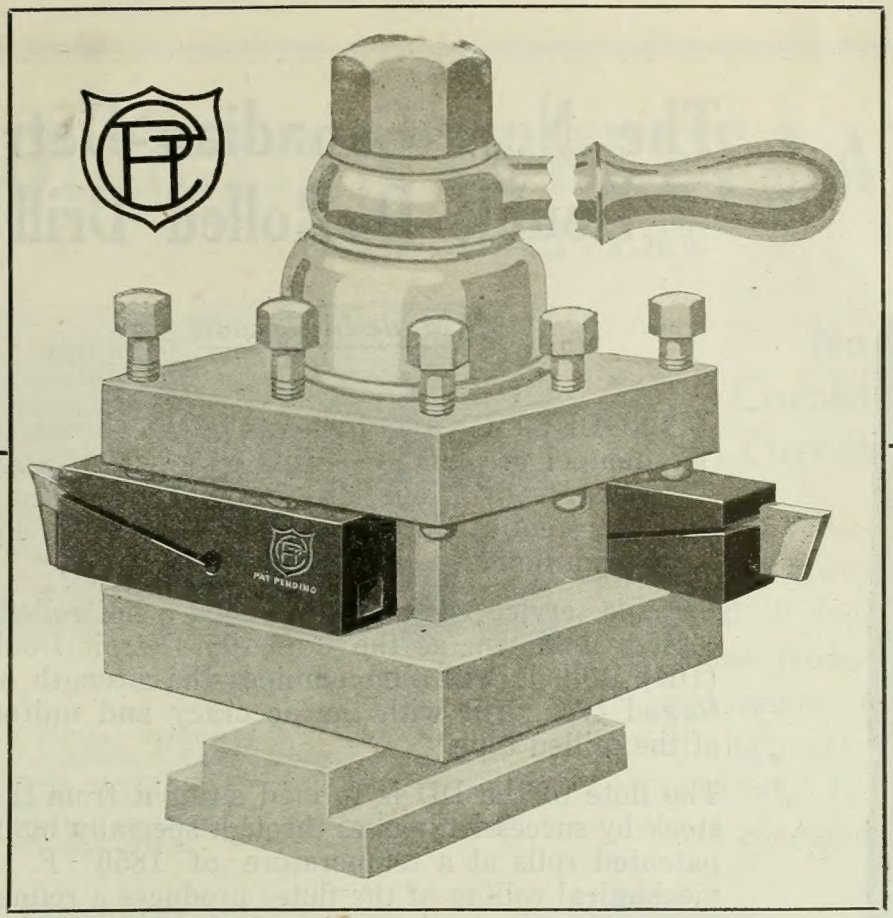


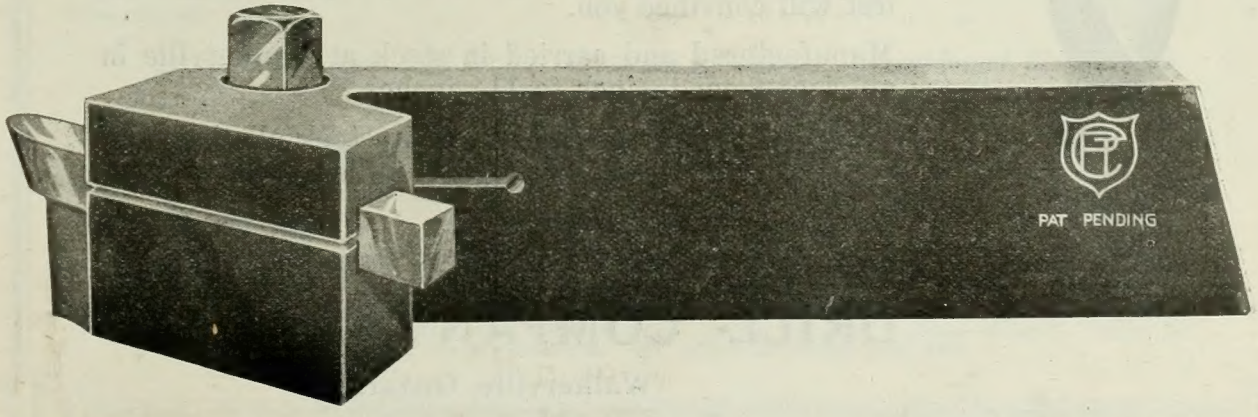
Announcing

CANADIAN PRODUCTION TOOL COMPANY LIMITED
WALKERVILLE, ONTARIO, CANADA

Manufacturers of High Grade

Tool Holders

Send for Catalogue



If interested tear out this page and place with letters to be answered.

The New Canadian-Detroit Double-D Rolled Drill

Made in Canada

PRODUCTION requirements in an ever-increasing number of plants necessitate the use of a strong, accurate drill, specially designed for hard drop forgings, steel castings, and other alloy steels equally tough and difficult to drill.

For this service we have developed a hot rolled process drill known as the Canadian-Detroit Double-D (DD) Rolled Drill. It combines the strength of the forged type drill with the accuracy and uniformity of the milled type.

The flute of the DD is formed straight from the bar stock by successive passes through specially built and patented rolls at a temperature of 1850° F. This mechanical rolling of the flutes produces a refinement and uniformity in the grain of the steel and gives additional density at the centre and at the outer edge. Each drill is rolled separately, and the rolls are so designed and operated as to produce the same uniform increase in web thickness as is obtained in high-grade drills of the milled type.

The fluted drill is reheated and twisted in a specially designed automatic machine. The twisting process is held absolutely uniform, giving the same increase in helix angle from shank to point, 27° to 32°. This standard has been adopted on our milled drills and has been proven by exhaustive experiments to be the most efficient.

The DD has increased production and cut drilling costs in many of the finest plants in Canada. A fair test will convince you.

Manufactured and carried in stock at Walkerville in all sizes from ½ inch to 1½ inches.

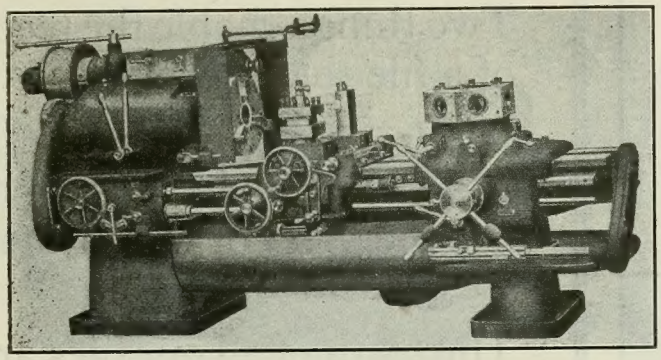
We also manufacture and carry in stock all sizes and types of high speed and carbon milled drills.

CANADIAN-DETROIT TWIST DRILL COMPANY, LIMITED

Walkerville, Ontario

PRODUCTION TURRET LATHES

STOCK DELIVERY



No. 9 Alfred Herbert Combination Turret Lathe.

Swings Over Bed	20″
Admits Through Spindle	3½″
Flange of Spindle to Face of Turret	48″
No. Spindle speeds Forward	16
No. Spindle speeds Reverse	16
No. Feeds to Turret Slide	18
No. Feeds to Carriage	9

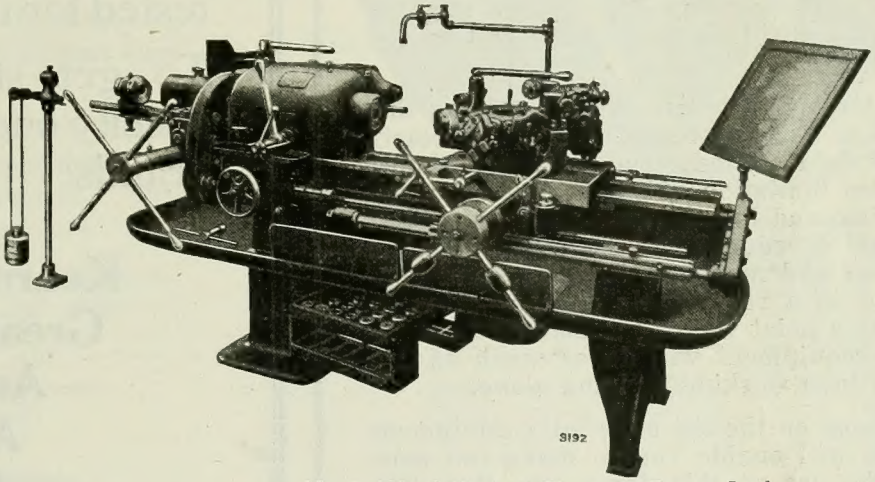
No. 9 Combination Turret Lathe

possesses not only the rigidity and power to remove metal at high speeds and coarse feeds, but also has and retains that exactness of alignment which enables it to take fine sizing cuts with consistent accuracy.

No. 1 Hexagon Turret Lathe

is built for bar work and constructed to permit large reductions at high speeds and feeds at one operation. It is especially adapted for quantity production where fine limits and high finish are desirable.

Bulletins No. 307-A and No. 309-A Sections E 5 & J respectively contain full information and complete specifications of these machines.



No. 1 Alfred Herbert Hexagon Turret Lathe

Largest Bar Admitted	1⅝″
Greatest Length Turned	27″
No. of Spindle Speeds	8
No. Feeds	6

Production Times Will Be Furnished on Receipt of Dimensioned Blue Prints

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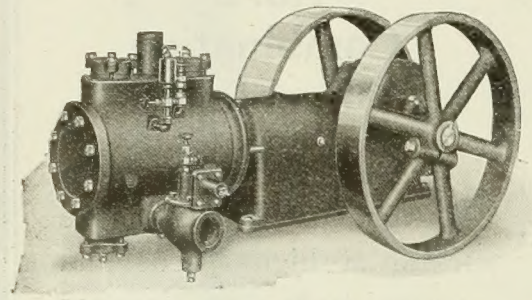
Turret Lathes, Engine Lathes, Horizontal Boring Machines, Boring Mills, Planing Machines, Slotting Machines, Shaping Machines, Profiling Machines, Grinding Machines, Sawing Machines, Precision Machines, Chucks, Die Heads, Tool Room Equipment, Foundry Equipment, Drills, Milling Cutters and Small Tools.

—DO IT WITH AIR—DO IT WITH AIR—DO IT WITH AIR—

Compressed Air

The Modern Industrial Force will help keep your Output Up and your Overhead Down



Class EL-1 Single Stage, Power Driven Air Compressor. Built in a wide range of sizes and capacities and shipped from stock. Illustrated and described in Bulletin K-300-C.

Many Industrial Executives are confronted with the problem of greater production—more rigid economy—the conservation of energy and full value for time and money spent.

One force that comes close to solving this problem is compressed air. In nearly every field of industrial activity, almost without limitation, this giant power is saving time and labor. Through its use "lost motion" is reduced and the productive time of men and machines increased and conserved to a remarkable degree—often in fact to a point where one man using pneumatic equipment will do as much as five or six men working by hand alone.

Foremost on the list of reliable equipment which will enable you to make the most efficient use of this force are Canadian Ingersoll-Rand Steam and Power-driven Air Compressors, Direct Lift Air Hoists, Little David Riveters, Chippers, Caulking Hammers, Drills, Wood Borers, Grinders, Sand Rammer Blow Guns, Stationary Air Motors, Motor Driven Air Hoists, etc. Write for bulletins on any or all of these products as the number of ways in which air operated equipment will prove a source of economy and a spur to production in your plant can best be determined by a study of our catalogues followed by a consultation with our nearest sales and service branch.

CANADIAN INGERSOLL-RAND CO.
LIMITED

Sydney Sherbrooke Montreal Toronto Cobalt
Winnipeg Nelson Vancouver

—DO IT WITH AIR—DO IT WITH AIR—DO IT WITH AIR—

Teeth that Cut --- Why ?

Two things enable the teeth of a file to cut properly—

(1) Proper shape and "set."
(2) Thorough hardening of the steel of which they were made.

The teeth of all our files are cut according to rigid standards by experts. The steel, of a special alloy variety, is thoroughly hardened and tested for temper.

To get standard quality, specify one of the following brands:

Kearney & Foot
Great Western
American
Arcade
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FILES

Made in Canada by

Nicholson File Company

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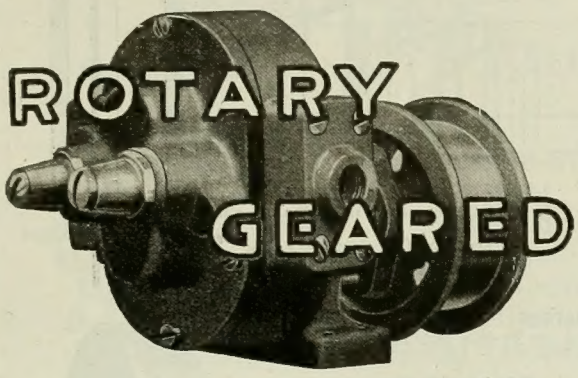
If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

REG. TRADE MARK
TRAHERN
REG. U.S. PAT. OFF.

ROTARY GEARED

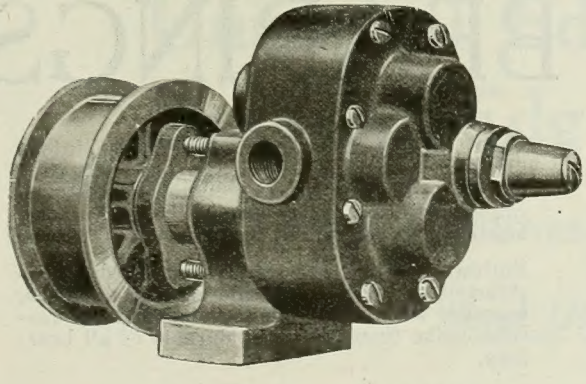


TRAHERN Pumps are for supplying coolant to cutting tools on machines of all kinds. They will pump water, oil, or compound. Reverse automatically with machines. Supply of coolant may be shut off at discharge without stopping pump.

They will deliver up to 16½ Gal. of coolant per minute at exceedingly low speed and without pulsation. Will operate against 100 lbs. pressure.

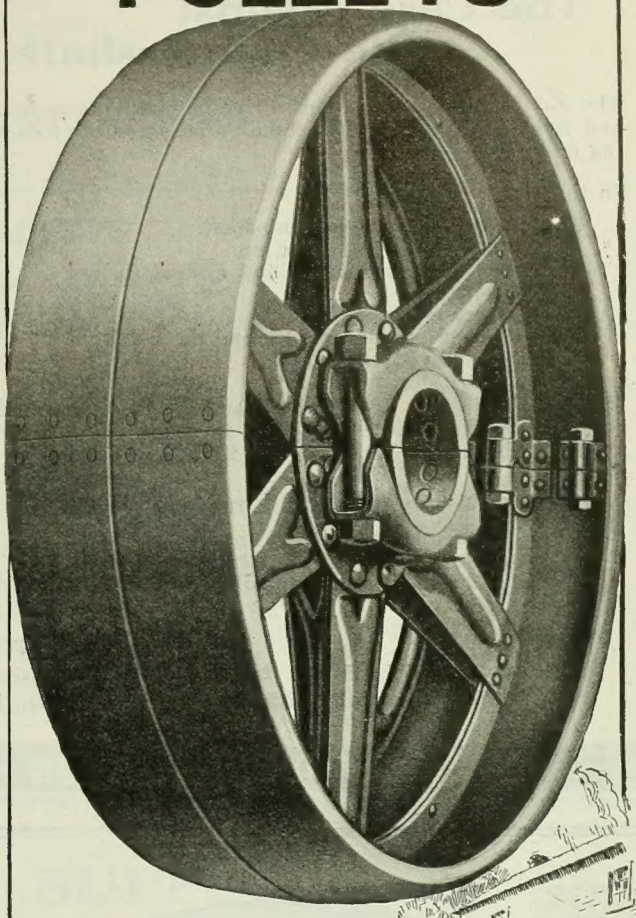
When installed as directed we guarantee they will not lose their prime.

Write for our Catalog No. 44.
It explains in full.



TRAHERN PUMP DIV.
Geo. D. Roper Corp.
ROCKFORD, ILLINOIS, U. S. A.

AMERICAN
STEEL SPLIT
PULLEYS



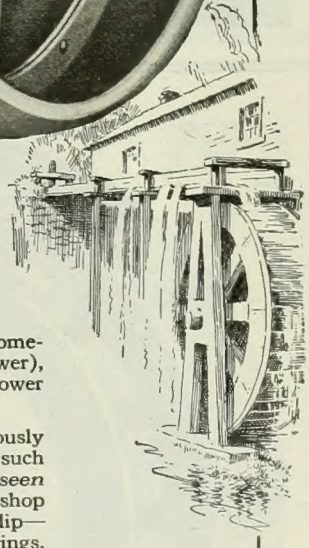


Figure the Cost of Pulleys in Terms of Saved Power

THE old sluiceway sometimes leaked water-(power), but who cared? That power was cheap—yet

Today, with tremendously expensive power costs, just such wastes are occurring *unseen* in the average machine shop through excessive belt slip—excessive friction in bearings, dead weight of pulleys that consume power.

How to overcome these troubles is explained in our book, "Getting Maximum Pulley Efficiency."

The American Pulley Company
Philadelphia, Pa.

The AMERICAN PULLEY
A wheel with a broad rim transmitting power from or imparting power to machinery, or changing the direction of motion by means of a flat belt.

THE JOHNSON FRICTION CLUTCH

The Case Against the Countershaft

The old familiar countershaft drive, through cross belts and tight and loose pulleys, stands accused of the following offences against efficiency.

In that it—

1. **Involves needless equipment.**
2. **Costs too much to set up.**
3. **Prevents economical and systematic use of space.**
4. **Operates sluggishly.**
5. **Multiplies belt troubles and the resultant cost of upkeep.**

Modern practice has discarded the antiquated countershaft for the simplicity and efficiency of the clutch drive direct from lineshaft.

Adopt the Johnson Lineshaft Drive

The economical, efficient and durable method of power transmission through friction control.

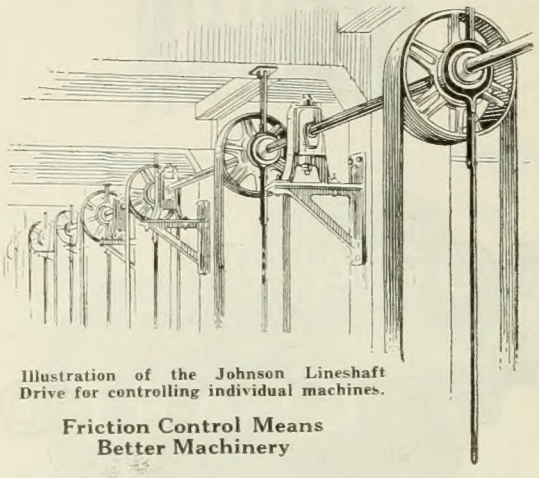
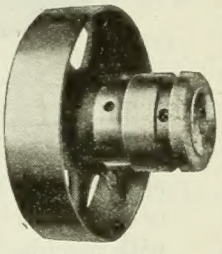


Illustration of the Johnson Lineshaft Drive for controlling individual machines.

Friction Control Means Better Machinery

Whether it is applied overhead or in the machine itself.

Write for our Booklet, "Clutches As Applied To Machine Building" and our Yellow Catalog.



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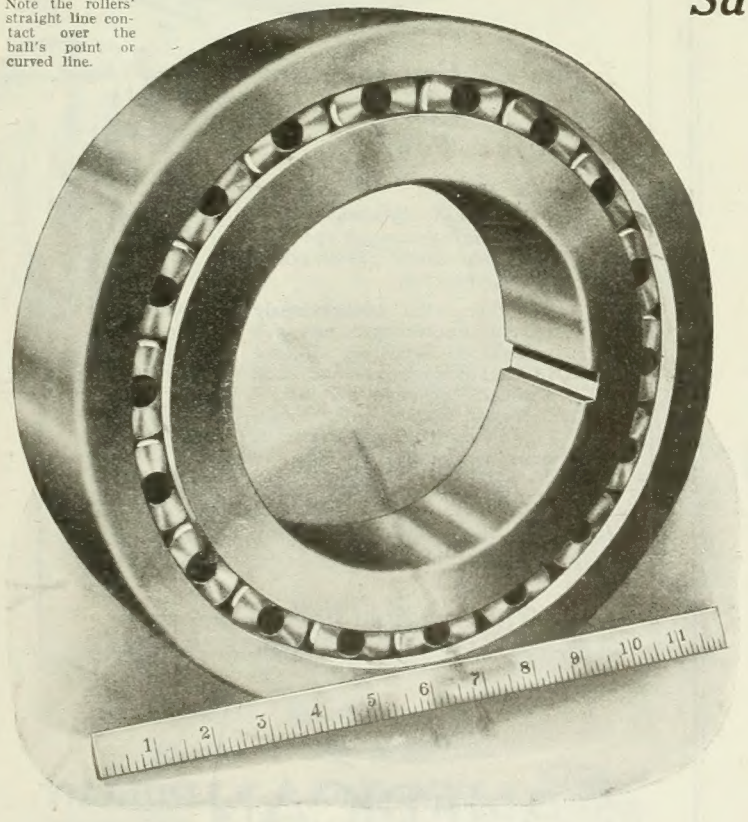
CANADIAN-FAIRBANKS-MORSE CO., LTD., Montreal, Toronto, Winnipeg

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER, CONN.

Note the rollers' straight line contact over the ball's point or curved line.



Save Oil, Power and Worry

By Using

ROLLWAY
HEAVY DUTY
BEARINGS

Under heavy loads and severe conditions "Rollway" Bearings are doing their part each day toward reducing the operating costs of railway motors, car journal boxes, cranes, hoists and steel rolling machinery.

Rollway bearings are simply and sturdily constructed of high-grade alloy steel, and this, together with their "straight line contact" feature, make them the most durable of all bearings.

Write for our latest catalogue.

Railway Roller Bearing Co.
SYRACUSE, N.Y.

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- Bolsters
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- Complete Intersection

This list is merely an indication

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STEEL PLATE

—IN—

Universal Edge - up to 40 in. wide

Sheared Edge - up to 60 in. wide

Any Thickness **Any Lengths**

Send Us Your Enquiries.

Dominion Foundries & Steel, Limited
HAMILTON, ONTARIO

If interested tear out this page and place with letters to be answered.

Anything Under 1¼ Inches in Diameter

This Company is equipped to make a "thousand-and-one" small parts—threaded or unthreaded—for any kind of mechanical device.

ACCURACY is the keynote of our service in this department. And therefore ECONOMY for the customer is assured because of our experience and unusually complete facilities for handling such work.

TIME SAVING, too, enters the picture, especially when it comes to assemblies. For we are organized to handle the ***whole*** job—as well as make the parts—if more convenient to you to have us do so.

Have it "Barnes-Made" and "Barnes-Assembled"—and have it RIGHT!

Write for Catalogue No. 9

Springs of steel, brass, phosphor bronze or vanadium—flat, coiled, spiral—compression, extension or torsion. Wire Forming, Spring Washers. Small Parts of steel, brass, etc., in any finish. Assemblies. High Carbon Cold-Rolled Steel.

SPRINGS, WIRE & STEEL — EST 1857 — "BARNES-MADE" PRODUCTS — SCREW MACHINE PRODUCTS

THE WALLACE BARNES COMPANY

Spring Makers for Three Generations

Main Office and Works: **Bristol, Conn.**

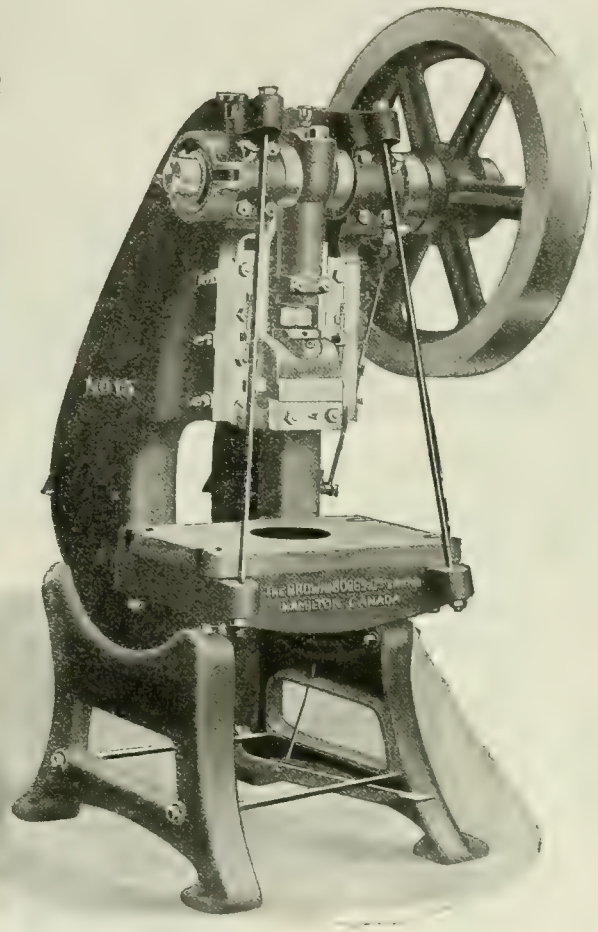
Western Sales Office: **Book Bldg., Detroit**

BROWN-BOGGS

B B

Make Sure of the "B-B" Trade-Mark

It is a Guarantee of Reliability



The "B-B" trade mark on power presses, shears, tinsmiths' tools and canners' evaporators, and sheet metal working tools of every description, is an iron-clad guarantee that it will give satisfaction on the work for which it is built. And because every tool before it leaves the factory is rigidly tested, we *know* that its merit is beyond question.

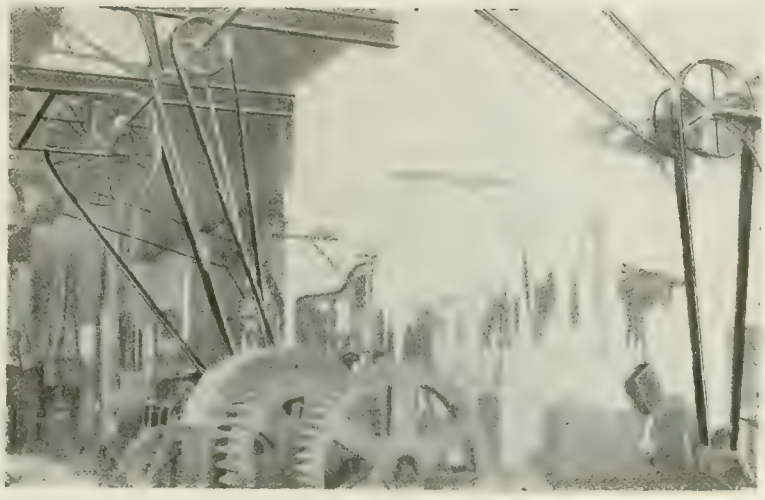
We shall be glad to send you catalogs fully describing those machines in which you are interested.

B B

THE BROWN-BOGGS CO. LIMITED

HAMILTON, CANADA.

Solid Woven Belting



Solid Woven Hair Belting
Driving Heavy Machine Tools

Solid Woven
Cotton
Hair
Twintex

These beltings will solve your driving problems and save you money.

SUMNER & CO.
108 WORTH ST.
NEW YORK

Representative for Eastern Canada
GEORGE F. SHEPPARD
702 Southam Bldg., Montreal

Buried in the Work and Broke!

Next time a tap breaks below the surface of a large casting, don't let some makeshift method of removing it injure the thread and waste half an hour of valuable production time. Instead—

Walton it Out in a Jiffy

And save the casting.

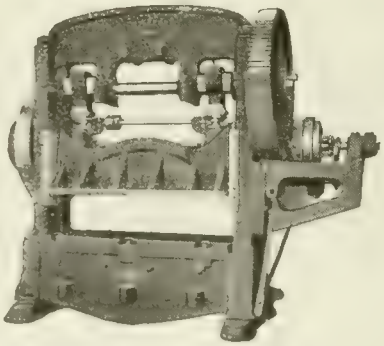
Special analysis steel fingers of the Walton Extractor drop into the flutes of the broken tap—and grip. Then a few turns of a wrench applied to the squared end of the Extractor backs out the buried tap.

Sixty-day trial offer proves the Walton Extractor pays for itself.

Write.

The Walton Co.
Hartford, Conn.

The "TOLEDO" Double Crank Presses



Built in over 200 sizes, weighing from 4,500 to 500,000 pounds, straight-side and gap, and overhanging frame types. Adapted to general sheet metal and drop-forged work.

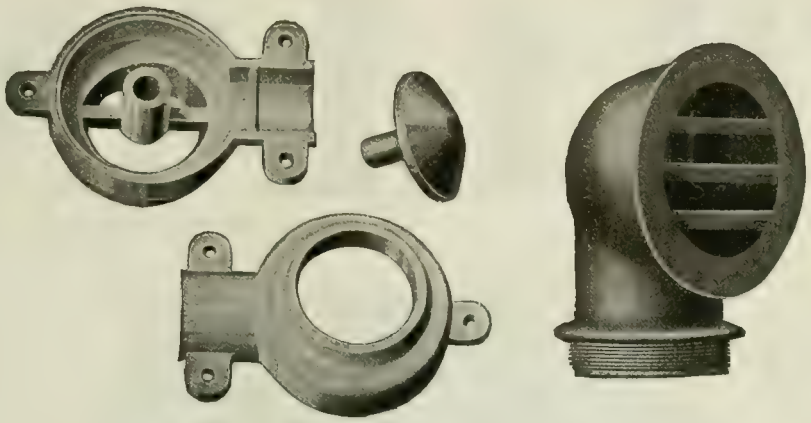
Rigid strength, durability and low upkeep, speed and accuracy have won throughout the entire continent, recognition of their merit.

Let us place the details of construction of these or other of our presses before you.

THE TOLEDO MACHINE & TOOL CO.
TOLEDO, OHIO

DIE-CASTINGS

DOEHLER PROCESS



MADE IN CANADA

Note the smooth appearance of the Die-Castings in the illustration. No burrs—no rough spots. Cored holes are perfectly round and centred. Require practically no machining

SEND BLUE PRINTS TO US FOR ESTIMATES

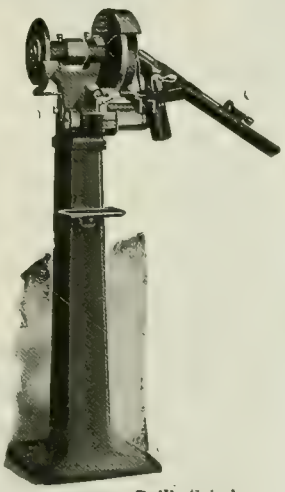
Manufactured by

Tallman Brass & Metal Limited
HAMILTON, ONT.

LA SALLE

Has an Advantage Over Other Grinders

There is some outstanding feature of all La Salle Grinding Machines that lends it exceptional productive ability.
The American Drill Grinder is especially adaptable for grinding twist, flat and three-lipped drills, because it has automatic lip rest and caliper jaw device, which assures proper clearance on all sizes of drills automatically. Send for descriptive matter covering our entire line of grinding machinery.



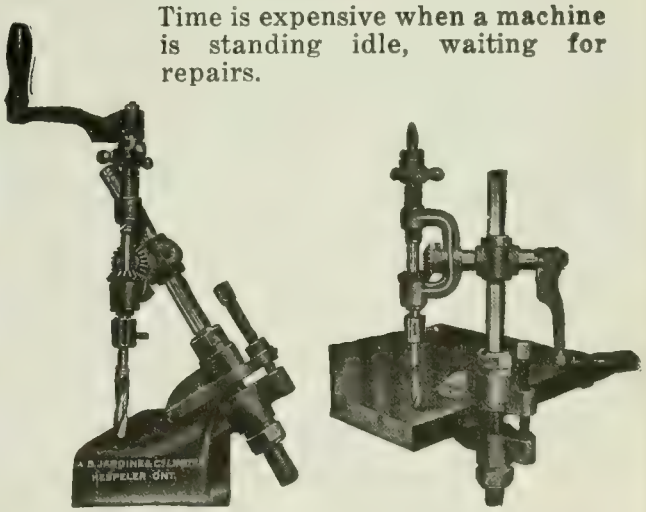
American Drill Grinder
For Wet or Dry Drill Grinding 1/8" to 2¼". Also 1/8" to 3½" dia.

LA SALLE TOOL CO.
La Salle, Illinois, U.S.A.

Represented in Canada by
A. R. Williams Machinery Co., Ltd.
64-66 Front Street W., Toronto
Halifax St. John, N.B. Montreal Winnipeg Vancouver

Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



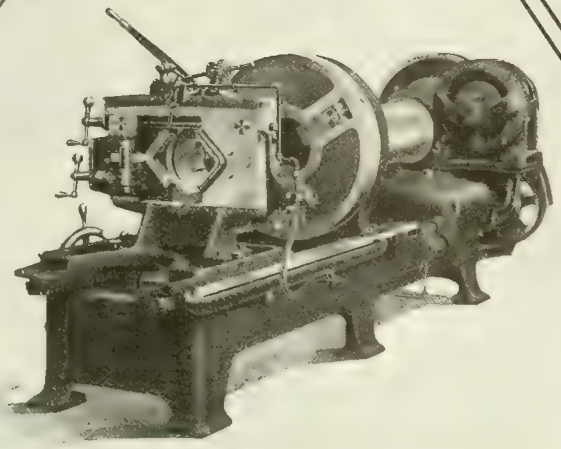
On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net.
Sold by all Machinery and Supply Houses.

A. B. JARDINE & CO., Limited
HESPELER, ONTARIO

If interested tear out this page and place with letters to be answered.

WILLIAMS



PIPE MACHINES

Outstanding Features:

1—Single Pulley Drive, through.
2—Dodge Friction Clutch, on machine.
3—Clutch Lever at operator's left hand.
4—Rigid Bearing Bracket on drive shaft.
5—Gear Box Drive away from operator.
6—Individual Adjustment for each bearing.
7—Large Spindle Bearings are ring oiling.
8—Compact Control Levers on operator's side.
9—Large Die Cabinet and Tool Tray.
10—Substantial Oil Trough around top of ways.
11—Specially constructed Reservoir and Filterer.
12—Low-down Sliding Head.
13—Rotary Geared Pump reversible for left-hand thread.
14—Specially designed Carriage to drain off oil and cuttings.
15—All Gears amply protected.

Send for Catalog of Various Styles

WILLIAMS TOOL CORPORATION

of Canada, Limited - Brantford, Ontario

Successors to

JOHN H. HALL & SONS, LIMITED

Speed PLUS Precision

In the design of Starrett Tools, *convenience* as well as accuracy is kept well in mind.

Mechanics who use fine tools prefer Starrett Tools not only because of their accuracy, but because of their durability and convenience.

This combination of qualities—characteristic of Starrett Tools—adds *speed* to precision in making the fine measurements of modern shop practice.

Catalog No. 22 "3" sent free on request

THE L. S. STARRETT CO.
The World's Greatest Toolmakers
Manufacturers of Hack Saws Unexcelled
Athol, Mass.

Starrett Bench Micrometer Caliper:
For measurement by thousandths or ten-thousandths up to one inch. Made with heavy base; very rigid and accurate.

Starrett Tools

STARRETT TOOLS

STARRETT HACK SAWS CUT QUICKER LAST LONGER

42-164

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Gear Cutting With the "IFS" Left Out

The Gear Shaper Way

A production manufacturer knows that he will secure good gears IF he has an accurate cutter, an accurate machine and a machine working on the correct principle. The whole question of good gears is resolved in this one little word "IF."

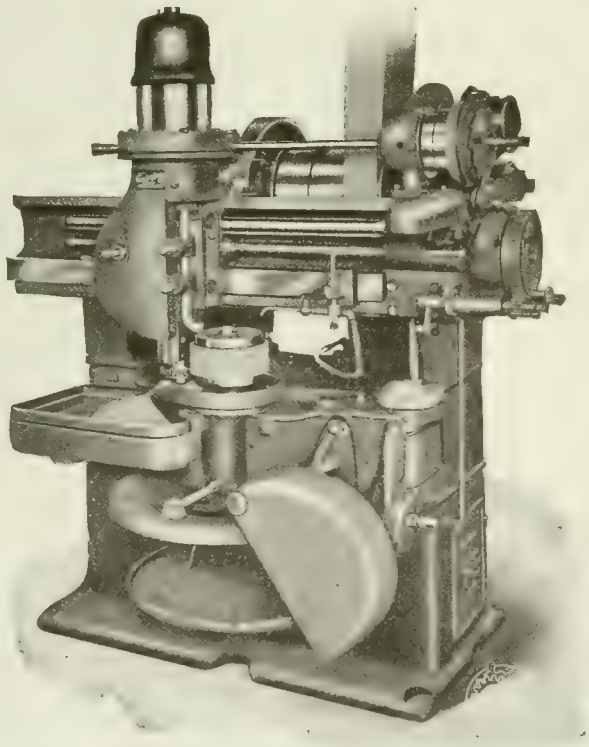
When the Gear Shaper was originally designed, the question of "IF" was taken into consideration and every possible means known to mechanical engineering was employed to eliminate the "IFS" from gear cutting.

That we have been successful in solving the problem is evidenced by the fact that each ensuing year sees a larger number of manufacturers adopting the Gear Shaper method.

How the Gear Shaper has accomplished this is clearly explained in our general catalog "Commercial Gear Cutting," which is a treatise on the subject of:—

Gear Cutting with the "IFS" Left Out.

Send for your copy to-day.

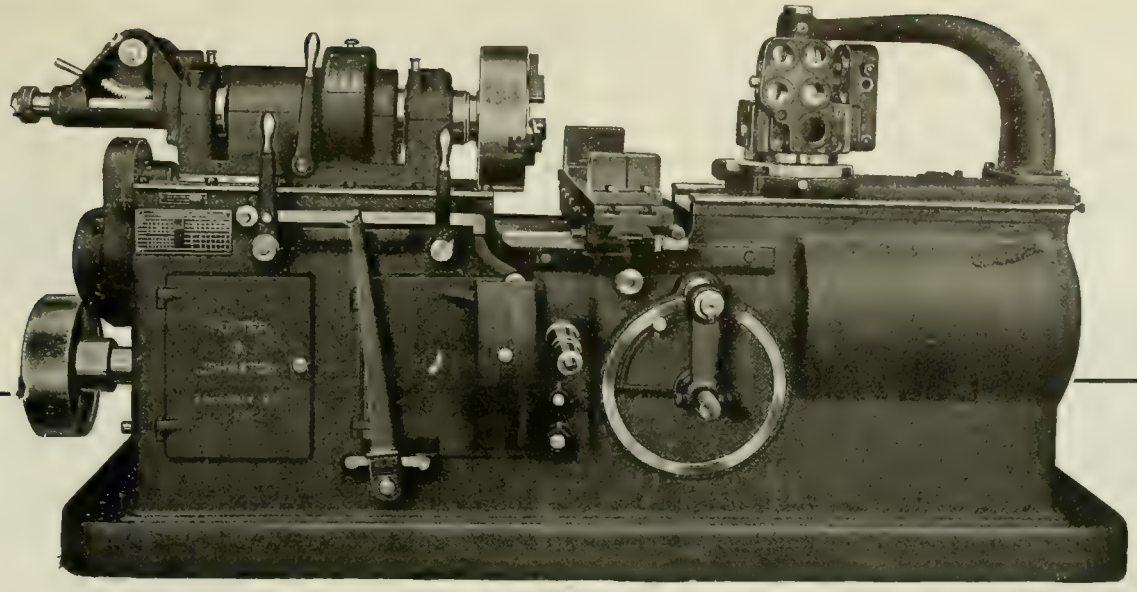


The Fellows Gear Shaper—the machine which has taken the "IFS" out of gear cutting.

The Fellows Gear Shaper Company

Springfield, Vermont, U.S.A.

FOREIGN AGENTS:—Alfred Herbert, Limited, Coventry, England; Societe Anonyme Alfred Herbert, Paris, France; Societa Anonima Italiana Alfred Herbert, Milan, Italy; Alfred Herbert, Limited, Yokohama, Japan; Societe Anonyme Alfred Herbert, Barcelona, Spain; Societe Anonyme Belge Alfred Herbert, Brussels, Belgium; Alfred Herbert (India), Limited, Calcutta, India.



Manufacturing Automatics

If you have work of this kind you can depend on the P. & J. machines to handle it right.

One man attends to three machines in the shop where this photograph was taken.

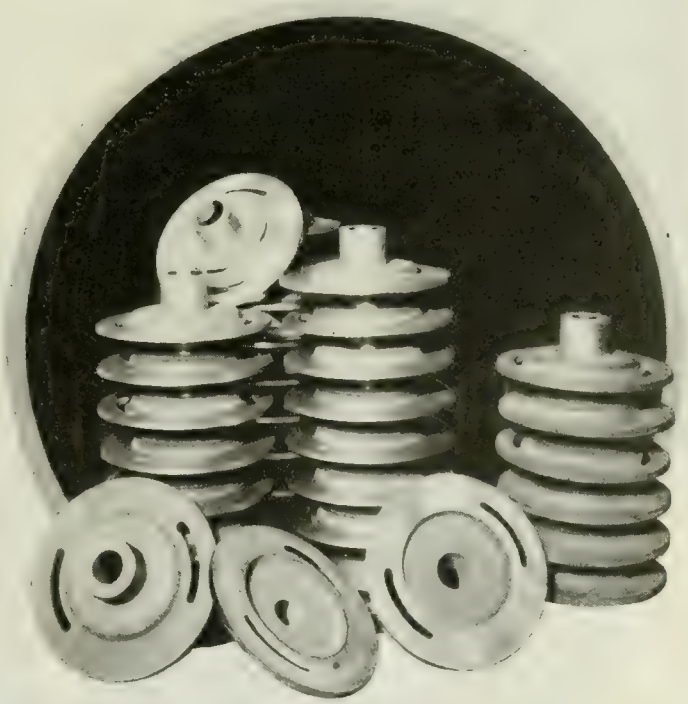
The material is Cast Iron.

Turning—Thickness of stock removed—1 1-16 in. Finished diam.—10 inches. Depth of cut 1 1-16 inches.

Facing—Rough Face, 3-32 inches taken off both sides.

Boring—1⅛ in. hole from ⅞ in. cored hole.

Reaming finished diam.—1⅛ inches.



Canadian Offices: POTTER & JOHNSTON MACHINE CO.

ROELOFSON MACHINE & TOOL CO., LIMITED

Head Office and Showrooms:

11 Wellington Street East, Toronto, Canada

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A FEW MONEL USES

VALVES—
Seats
Rings
Guide Stems
Clappers
Wedges
Spindles
Dash Pots
Pistons

PUMPS—
Pump Liners
Runners
Valve Seats
Trim
Hand Hole Covers
Plunger Rods
Stuffing Boxes
Plungers

METERS—
Cylinders
Bushings
Valves
Valve Parts
Spindles
Screws
Gears
Wheels

GAS & OIL ENGINES—
Valves
Ignition Chambers
Ignition Tubes
Fuel Filters
Scavenger Valves

TURBINES—
Poppet Valve Parts
Blading

GAUGES—
Pins
Pivots
Diaphragms

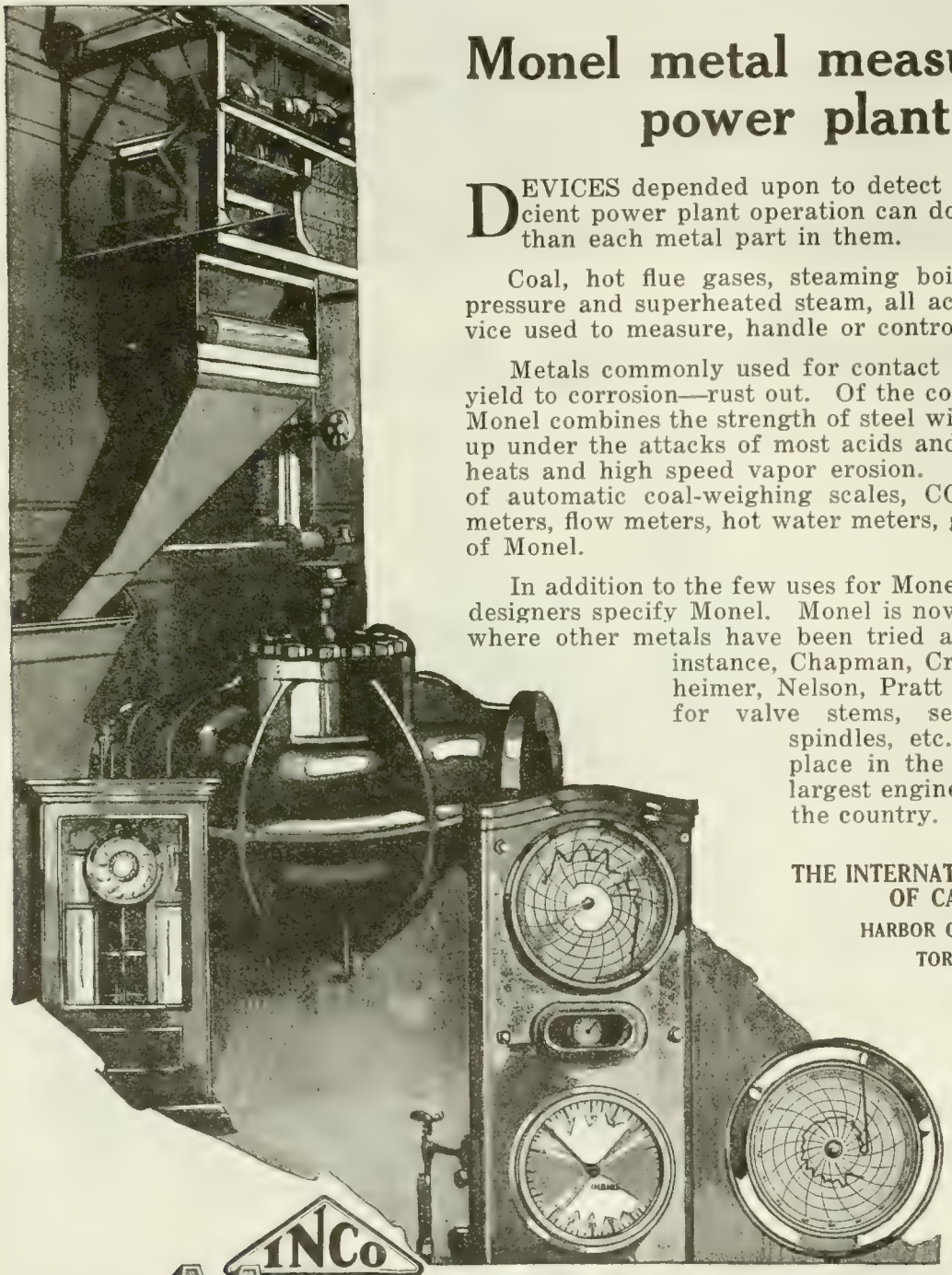
CONVEYING APPARATUS—
Chains
Buckets
Hoppers

AIR COMPRESSORS—
Valves

BLOWER FANS—
Blading

THERMOMETERS—
Bulbs

SPECIAL APPARATUS—
Watchman Recorders
Watthour Recorders



Monel metal measures power plant efficiency

DEVICES depended upon to detect and "show up" inefficient power plant operation can do their work no better than each metal part in them.

Coal, hot flue gases, steaming boiler feed water, high pressure and superheated steam, all act to wear out the device used to measure, handle or control them.

Metals commonly used for contact parts in these devices yield to corrosion—rust out. Of the commercial metals, only Monel combines the strength of steel with the ability to stand up under the attacks of most acids and alkalies and of high heats and high speed vapor erosion. Therefore, vital parts of automatic coal-weighing scales, CO_2 Recorders, Venturi meters, flow meters, hot water meters, gauges, etc., are made of Monel.

In addition to the few uses for Monel listed above, leading designers specify Monel. Monel is now used in many places where other metals have been tried and have failed. For instance, Chapman, Crane, Jenkins, Lunkenheimer, Nelson, Pratt & Cady use Monel for valve stems, seats, rings, clappers, spindles, etc. It has a prominent place in the specifications of the largest engineering organizations in the country.

THE INTERNATIONAL NICKEL COMPANY OF CANADA, LIMITED
HARBOR COMMISSION BUILDING
TORONTO, ONTARIO

The name Monel identifies the natural nickel alloy—67% nickel, 28% copper and 5% other metals—produced by The International Nickel Company. Monel products include Monel blocks, Monel rods, Monel castings, Monel sheet, Monel wire, Monel strip stock, etc.

INCo Monel metal

THE INTERNATIONAL NICKEL COMPANY

INCo MONEL METAL INCo NICKEL

Canadian Hart Wheels

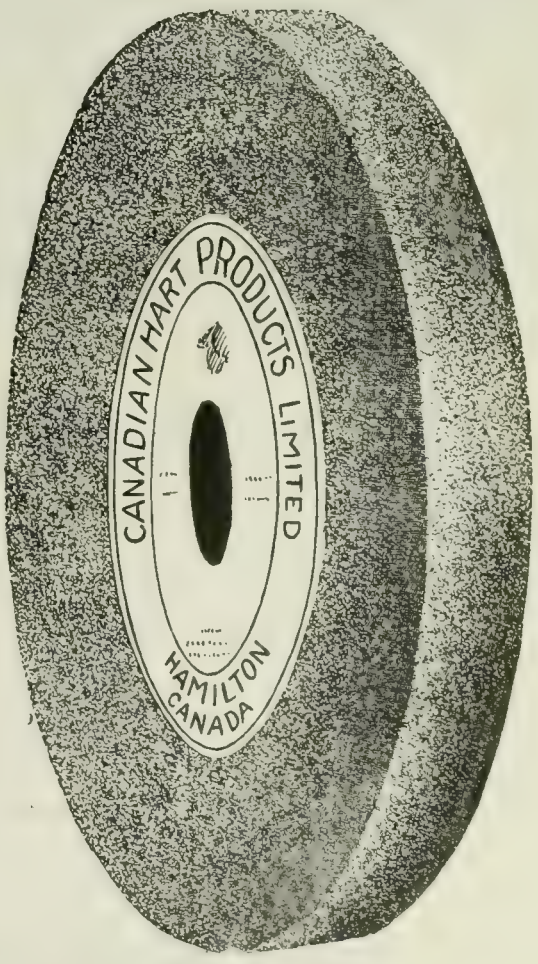
Vitrified — Silicate — Shellac

TELL us what you want to grind and we will tell you the wheel to use for the best results.

Canadian Hart Vitrified Wheels—recommended for the majority of grinding jobs. May be used wet or dry; give better all-around satisfaction and have a longer life.

Canadian Hart Silicate Wheels—can be made in twenty-four hours and are often substituted when it is inconvenient to wait the required length of time for Vitrified Wheels.

Canadian Hart Shellac or Elastic Wheels—indispensable for slotting work where a thin wheel is required, or for work requiring a special finish. Can be operated wet or dry.



Canadian Hart Products
LIMITED

Hamilton - Ontario

Made in Canada

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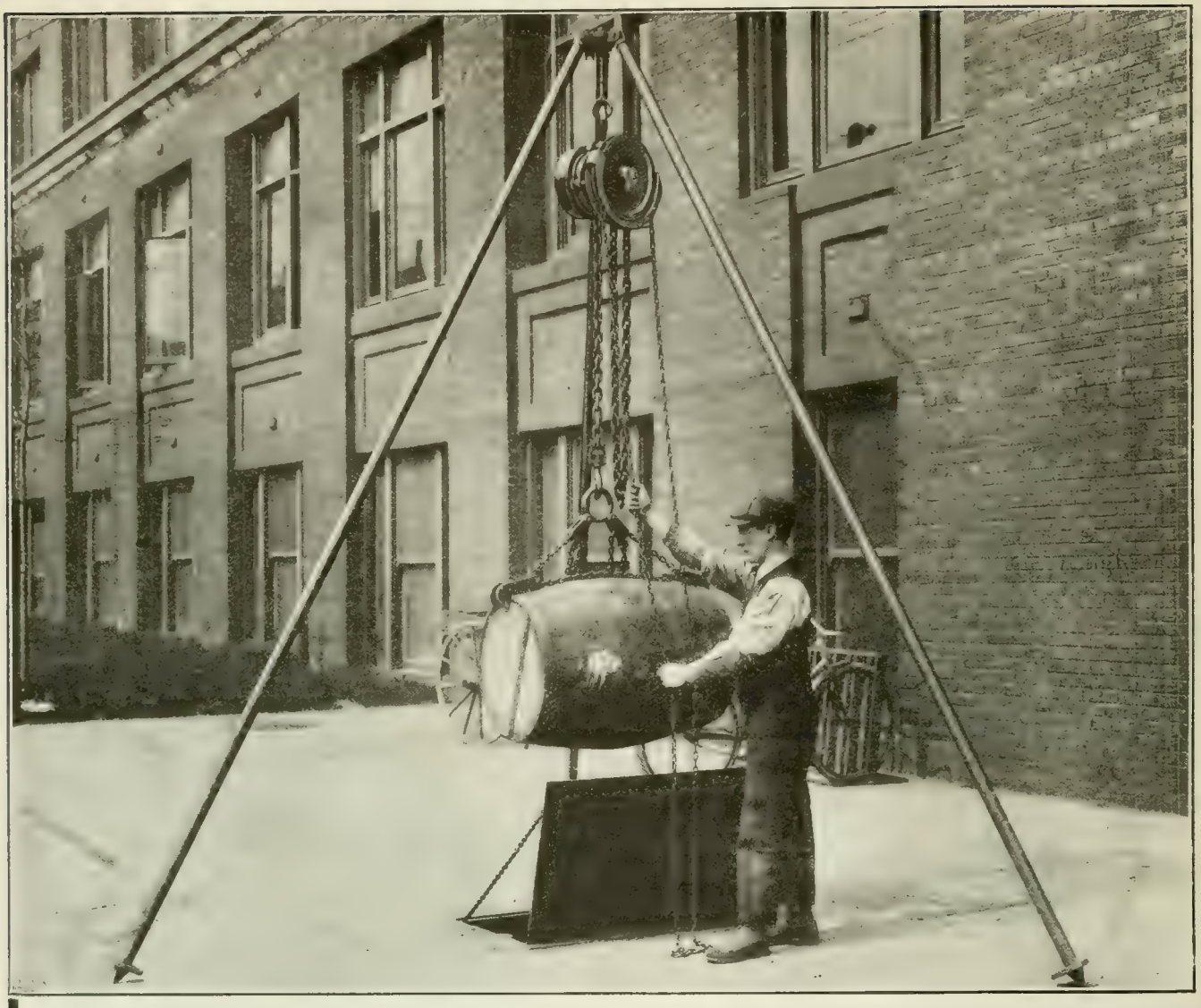


A FOLDING STEEL TRIPOD

Fitted with a Morris Triple Gear or Worm Gear Chain-block and used for setting machinery and making the occasional difficult lifts around your plant, will soon pay for itself and will occupy but little space when not in use.

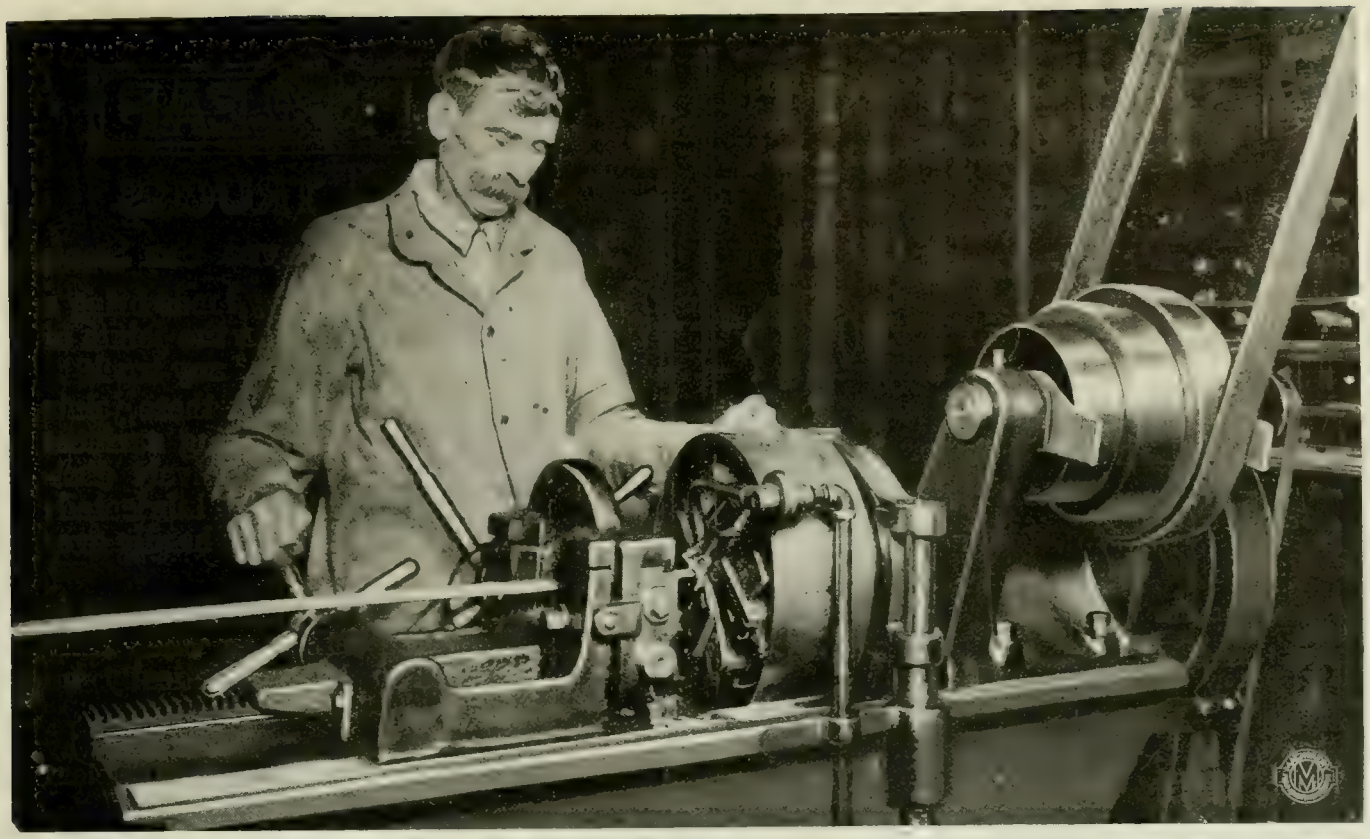
THE HERBERT MORRIS CRANE & HOIST CO., LIMITED

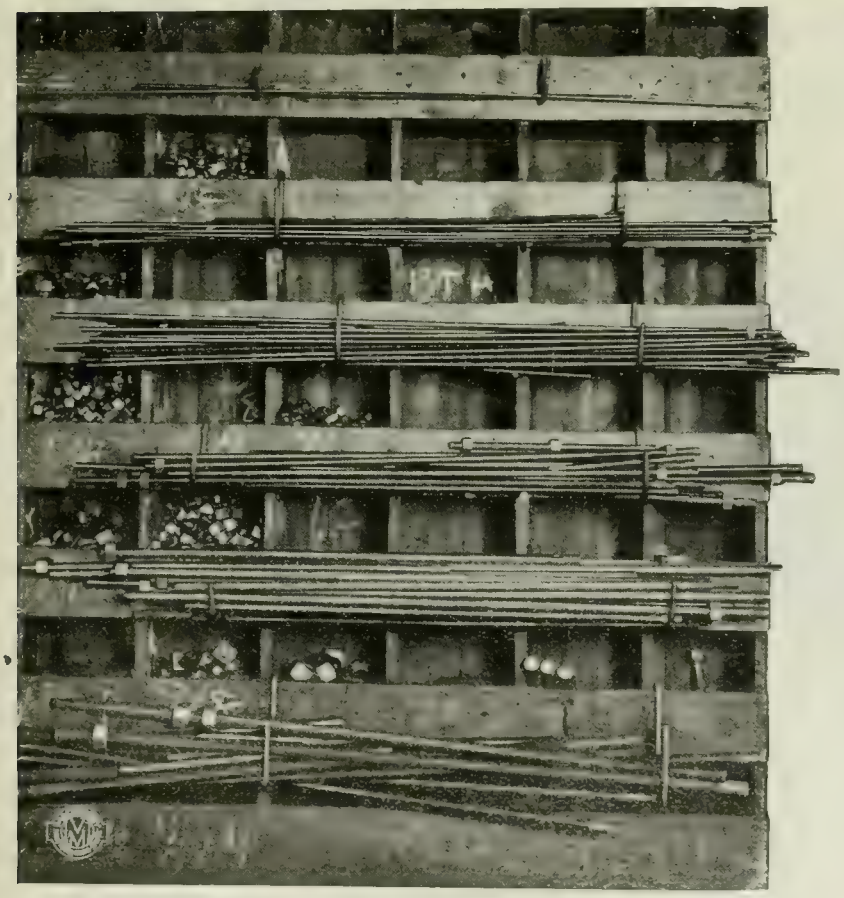
HEAD OFFICE and WORKS
NIAGARA FALLS, CANADA

Specialists in the design, manufacture and application of lifting machinery and material handling equipment.

HERBERT MORRIS

Cranes and Chain Blocks





LANDIS
Threading Machine

A Paying Proposition on the "Short-run" Job.

Everybody knows, of course, that for high speed quantity production the Landis Threading Machine is a record breaker. Now comes the P. H. & F. M. Roots Co., Connersville, Ind., and says that on the "short-run" job it's just as good because of the ease with which the set-up may be changed for different diameters of work, and the long-lived chasers.

Use the Landis Threading Machine for every threading job. You'll find it a paying proposition from the first.

Ask us for illustrated catalogue showing the complete Landis line.

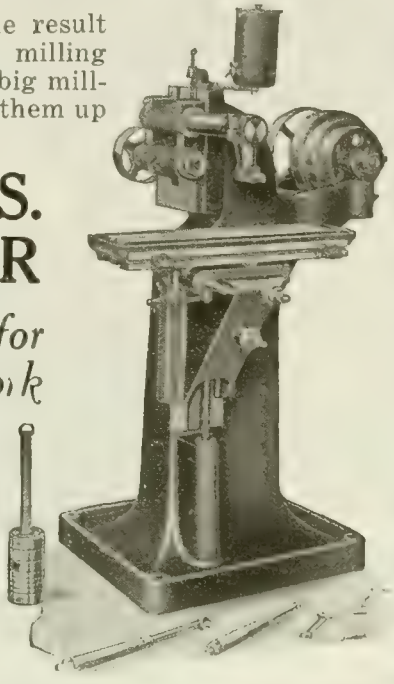
LANDIS MACHINE COMPANY, INC.

WAYNESBORO, PENN., U.S.A.

Exclusive Canadian Agents: **CANADIAN FAIRBANKS-MORSE, CO., LIMITED**

1/3 to 1/2 Reduction in Milling Cost

This will be the result of taking small milling jobs from your big millers and putting them up to



The U.S. MILLER

The Miller for Small Work

A small machine takes up less space, requires less power, is easier to operate and is more accurate.

The Paramount Miller of its size. Drop us a line for full details.

United States Machine Tool Company
Cincinnati, Ohio, U.S.A.

MAPLELEAF
MOTOR TRUCKS

The Joint that Saves the Snap

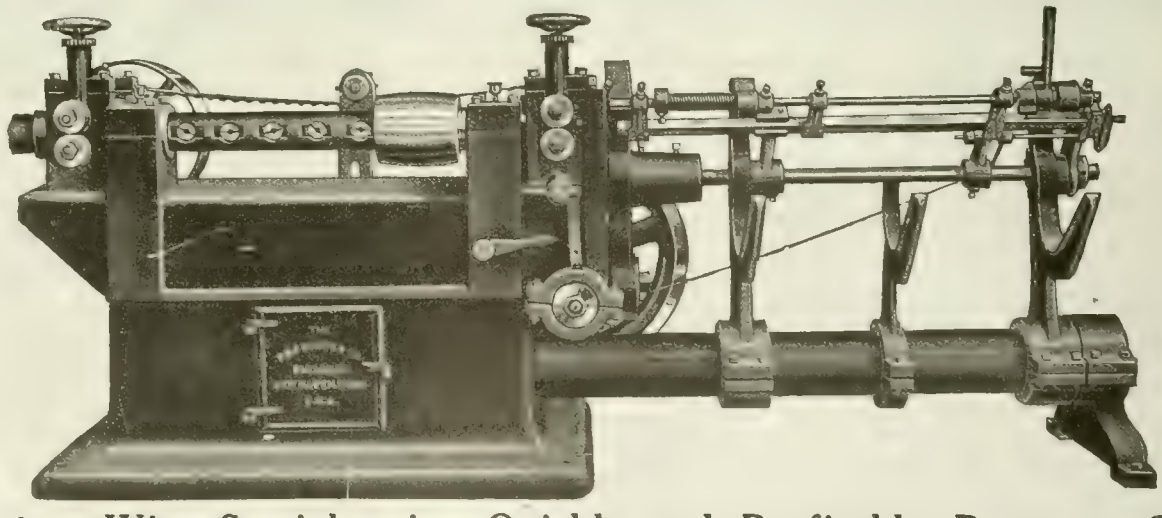
Deep ruts and heavy loads bring a tremendous strain on the joints of the propeller shaft of any truck.

In a Mapleleaf Truck these joints have the largest bearing surfaces made. They are positively dust-proof and positively lubricated; which means that they hardly ever have to be replaced.

Then again, the propeller shaft is so designed that even when fully loaded they have practically no bend.

That is just one of the reasons why the wearing qualities of a Mapleleaf Truck are so remarkable.

Mapleleaf Manufacturing Company, Limited.
MONTREAL : CANADA



Perfect Wire Straightening Quickly and Profitably Done on Our

Automatic Wire Straightening and Cutting Machine

Just put your coil of wire on the reel, adjust the rolls and dies, and set the gauge for the length you want. The machine does the rest—thousands of feet per day, perfectly straight and cut to accurate lengths.

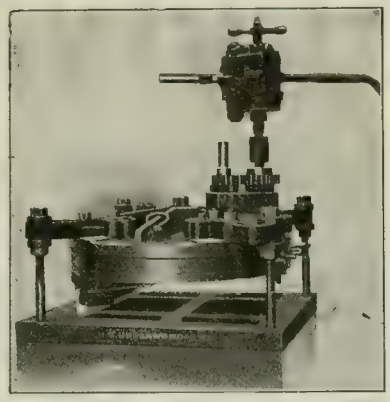
Catalogue tells more about them, and we will be glad to send you a copy.

THE F. B. SHUSTER CO., New Haven, Conn.

FORMERLY JOHN ADT & SON ESTABLISHED 1886
ALSO MAKERS OF STRAIGHTENERS FOR SQUARES, HEXAGONS, FLATS, ETC.

Portable Valve Seat Planer

Constructed to Stand Heavy Work

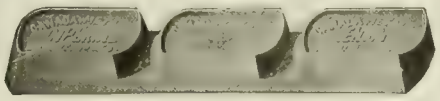


Our latest Portable Valve Seat Planer is of a rigid construction capable of withstanding heavy work without spring or strain. It will easily plane as heavy a cut as is required for valve seat work—facing off, at one cut, deeply worn valve seats.

Full particulars of this and any other Underwood machines will gladly be forwarded upon request.

H. B. UNDERWOOD CORPORATION
1025 Hamilton St., - Philadelphia, Pa., U.S.A.

WHY EXPERIMENT ?
WE DID IT FOR YOU YEARS AGO



IMPERIAL GENUINE

For Heavy Engines and Extraordinary Hard Work

HARRIS HEAVY PRESSURE

THE COPPER COATED CAKE

For Donkey Engines, Saw Carriages, Small Motors, Transmission Line Shafting and all steady heavy pressure duty.

Matchless

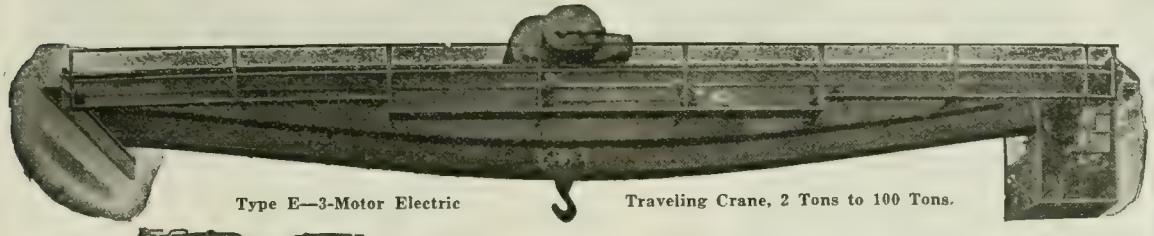
Suitable For Slow-Moving Bearings

Write For Prices

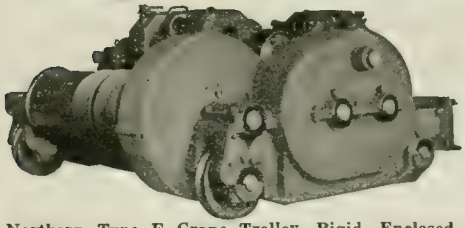
THE CANADA METAL CO., LIMITED
TORONTO HAMILTON MONTREAL
WINNIPEG VANCOUVER

CANADIAN MADE CANADIAN MADE

Electric and Hand Traveling Cranes

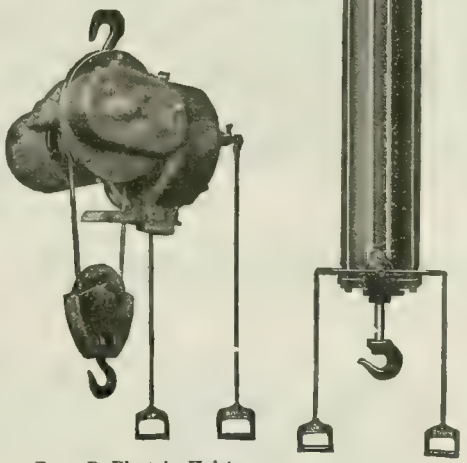


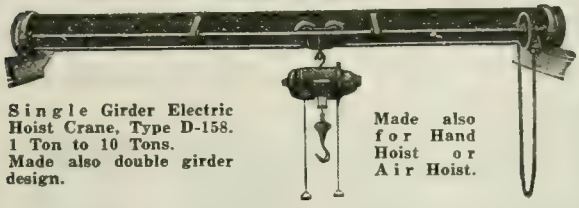
Type E—3-Motor Electric Traveling Crane, 2 Tons to 100 Tons.



Northern Type E Crane Trolley, Rigid, Enclosed Construction. Patented in Canada.

We make a wide range of CRANE and HOIST designs. All sizes and capacities, 1 ton to 100 tons.





Single Girder Electric Hoist Crane, Type D-158. 1 Ton to 10 Tons. Made also double girder design.

Made also for Hand Hoist or Air Hoist.

Get our prices and specifications before you buy.

In asking prices, state SERVICE CAPACITY, SIZE OR SPAN POWER, and, if electric, KIND OF CURRENT.

Catalogs free.

Type D Electric Hoists—½ to 10 Tons.

Air Hoists, Trolleys and Tracks

Type No. 20 Air Hoists.

Northern Crane Works, Limited
Walkerville, Ontario, Canada

If interested tear out this page and place with letters to be answered.

The Sign of Efficiency

MORSE DRIVES

The Sign of Durability

THE MORSE "ROCKER JOINT"

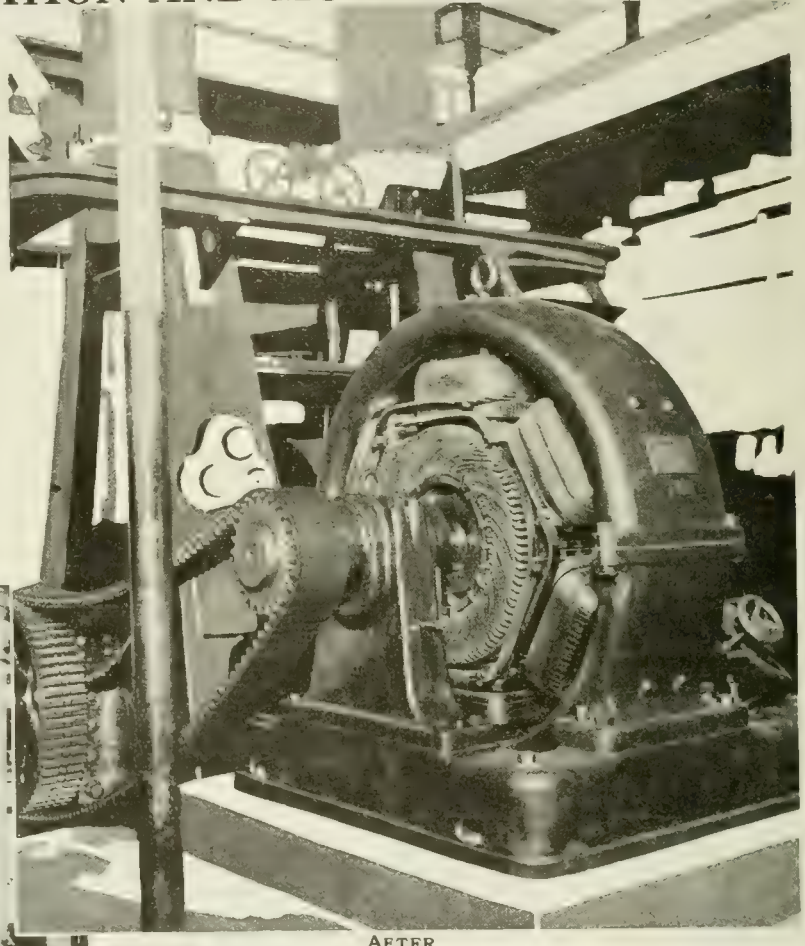
Positive as Gears

Flexible as a Belt

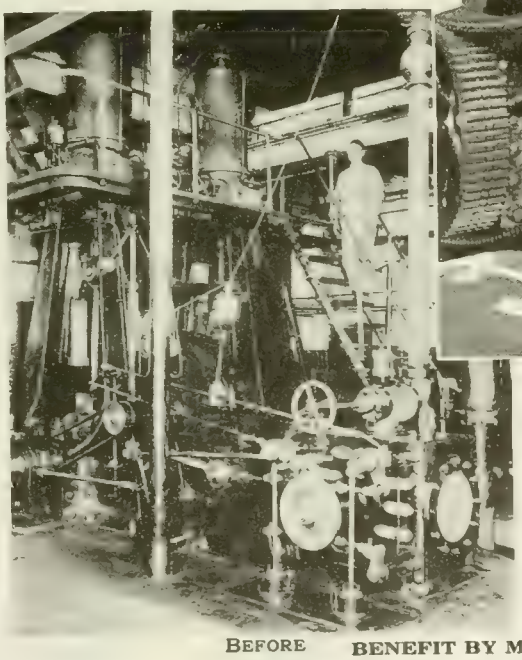
Longer Life

SAVED THE SITUATION AND MORE THAN SATISFY

PRODUCTION and Cost confronted this well known Meat Packing House in Baltimore. They contemplated taking out Corlis Engine driven Ammonia Compressor and installing a new direct connected set. The engineers consulted "MORSE ENGINEERING SERVICE" and thru the use of MORSE Silent Chain Drives, this expense was cut down, floor space saved, efficiency increased, and a still more satisfactory operating compressor maintained.



AFTER



BEFORE

100 H. P. Drive, 106" Centers, 8" Wide, 2" Pitch, 25—69 Teeth, 150—54 R.P.M.

No Slip, 98.6% Efficiency. Oil Baths not Required

Are you looking for improvement in power transmission, the saving of fuel, the saving of floor space by short centers, fixed speed ratios, improved quality, increased production, lower maintenance cost, longer life and dependability, the increase of profits now lost through slipping belts? Investigate MORSE Silent Chain Drives. Let MORSE Engineers give your conditions their careful research.

BENEFIT BY MORSE SERVICE AS OTHERS DO

Write Today for Booklet

MORSE CHAIN CO., ITHACA, N. Y.

LARGEST MANUFACTURERS OF SILENT CHAINS IN THE WORLD

Morse Engineering Service

Assistance Without Obligation

Address Nearest Office

MORSE CHAIN COMPANY ITHACA, NEW YORK

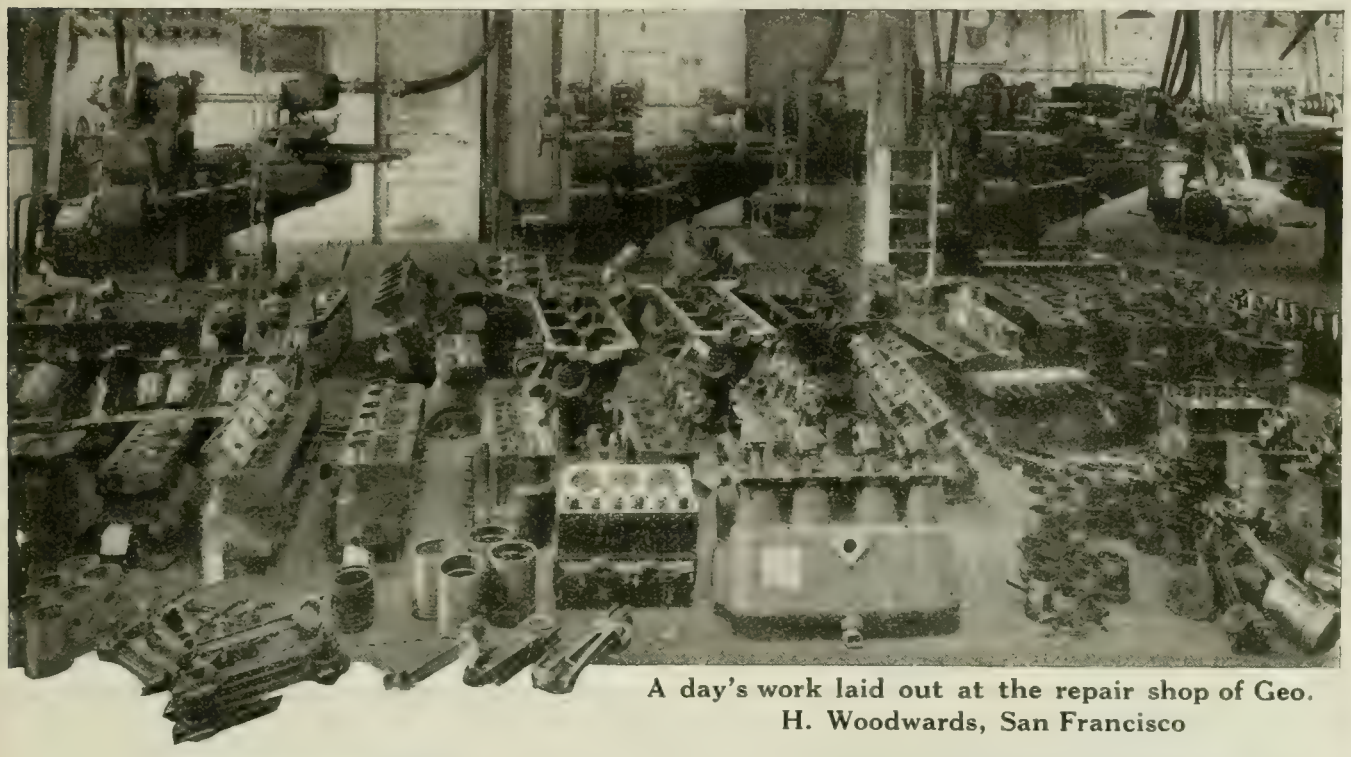
BALTIMORE, MD. ..... 1402 Lexington Bldg.
BOSTON, MASS. ..... 141 Milk Street
CHICAGO, ILL. ..... Merchants Loan & Tr. Bldg.
CLEVELAND, OHIO ..... Engineers Bldg.
DETROIT, MICH. ..... Cor. 8th & Abbott Sts.
CHARLOTTE, N. C. ..... 404 Commercial Bk. Bldg.
NEW YORK CITY
50 Church St., Hudson Term. Bldg.
PITTSBURGH, PA. ..... Westinghouse Bldg.
PHILADELPHIA, PA. ..... 302 Harrison Bldg.
SAN FRANCISCO, CALIF. ..... Monadnock Bldg.
ATLANTA, GA., Earl F. Scott, M. E. ..... 702 Candler Bldg.
CANADA ..... Jones & Glassco, Reg'd.
MONTREAL ..... St. Nicholas Bldg.
TORONTO ..... Traders' Bk. Bldg.
KANSAS CITY, MO., Morse Engineering Co. ..... Finance Bldg.
MINNEAPOLIS, MINN., ... Strong-Scott Mfg. Co. 413 Third St., S.
ST. LOUIS, Mo., Morse Engineering Co: ..... Chemical Bldg.

MORSE CHAIN COMPANY ITHACA, NEW YORK

"Morse" is the Guarantee Always Behind the Efficiency, Durability and Service

Small Machine Shops, Auto Repair Shops Welding Companies

Do you want a business like this?



A day's work laid out at the repair shop of Geo. H. Woodwards, San Francisco

Opportune Time

There is no business to-day that has the possibilities and which fits so nicely into a small machine shop, automobile repair shop, or a concern doing welding, as the regrinding of worn or scored cylinders.

Many companies would have had to close their doors this Spring but for the business obtained through regrinding. It does not require skilled mechanics for operators, and the profit received on the capital invested is unusually large.

The Field for Regrinding

There were over 9,000,000 commercial and pleasure cars registered during last year. Truck and tractor cylinders require attention once a year. Passenger cars should be looked over at least once every two or three years. Figure out for yourself what your chances are with only approximately 350 concerns properly equipped for such work. Consider also the fact that three 4-cylinder blocks a day will bring profitable returns.

Advantages to the Automobile Owner

Reground cylinders fitted with new pistons and rings will give the motor as much, if not more, power and pep than when it was new. It cuts the oil and gas consumption in two and stops all excessive smoking.

Necessary Equipment

Eighty-four per cent. of all pleasure cars, and ninety-one per cent. of all commercial motors manufactured are ground, and Heald Machines are used exclusively. The Style No. 55 is built expressly for regrinding work. It is simple, moderately priced, self-contained, and has a very large capacity and range, easily taking care of singles, doubles, four and six en bloc cylinders.

In addition, to handle the work satisfactorily, one should have a small lathe and drill press, bench and hand tools. A small external grinder would be convenient for finishing pistons, thus enabling the shop to purchase semi-finished pistons and grind them to the oversize required.

Now is the logical time to get started. If you want figures, in addition to the above facts, write, wire or 'phone

The Heald Machine Company

51 New Bond Street **Worcester, Mass.**

Branches at New York, Philadelphia, Buffalo, Cleveland, Detroit, Chicago, Cincinnati

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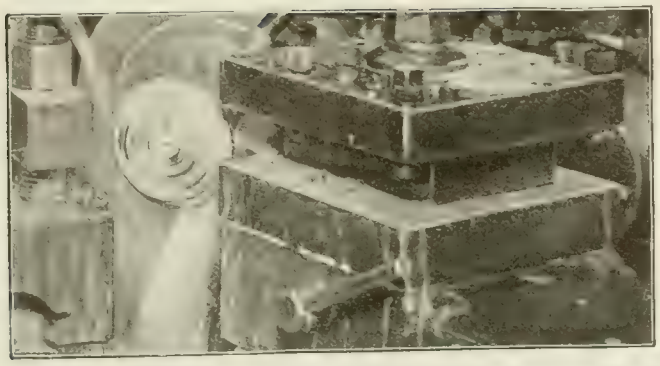

This is what Larcul did for us:

"On a Gould & Eberhardt, also B. & L. Milling Machines. Milling Cutter 6" diameter, 28-tooth, 8" wide. Stock 60 degrees carbon, 16% tungsten. Cutter speed 157 feet per minute. Milling cut across cutter 8", time—8 minutes. Finish glass smooth and sharp. Needless to say, we are very much pleased with results."

This is only one of the many letters we receive from enthusiastic users of

LARCUL CUTTING OILS

Your production line takes a big upward sweep when you start to use LARCUL. More individual pieces can be turned out in a day, because your machines run faster, without overheating the tools. As LARCUL positively carries off the heat, tools hold their cutting edge longer and hence do not require frequent re-sharpening, with its consequent delays—another saving in time that helps to boost production.

LARCUL AMBER, a transparent cutting oil for high carbon, vanadium, chrome nickel and tungsten steel; and LARCUL EBONY for open hearth, low and high carbon steel.

A demonstration entails no obligation. Write us about your cutting problems—To-day!

Cataract Refining Company
Limited
TORONTO ONTARIO

SCIENTIFIC LUBRICANTS for SCIENTIFIC LUBRICATION

GENUINE EMERY

Sizes 180, 160, 140, 120, 110, 100, 90, 80, 70, 60, 54, 46, 40, 36, 30, 24, 20, 18, 16, 14, 12, 10, 9, 8, hole.

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Emery, Glass, Flint, Garnet, Corundum, Carborundum — Paper and Cloth — In Sheets, Rolls, Discs, Bands, Strips and Tapes, &c.

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HIGH SPEED STEEL
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Tool Steel for Every Purpose
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Twist Drills, Taps, Hack Saw Blades, Milling Cutters, Files, Etc.; Music Wire for Springs, Steel Balls, Cold Rolled Tool Steel in Strips and Sheets, Circular Saws, Machine Knives.

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Sole Agents for
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GREY IRON CASTINGS

Also

Brass, Bronze, Aluminum, Copper, Zinc and Nickel Castings

QUALITY!
SERVICE!

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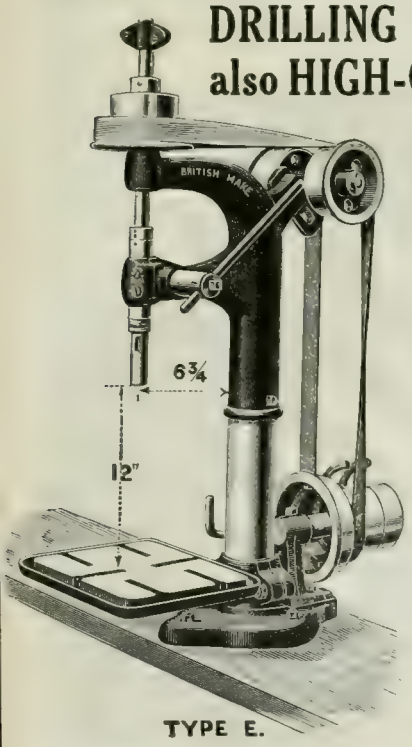
SENSITIVE BENCH and PILLAR DRILLING MACHINES also HIGH-CLASS BALL BEARING DISC and TOOL GRINDERS



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TEN DIFFERENT TYPES, ALL FROM STOCK

Telegrams:—
"BEACO TIPTON"
ENGLAND

Telephone:—
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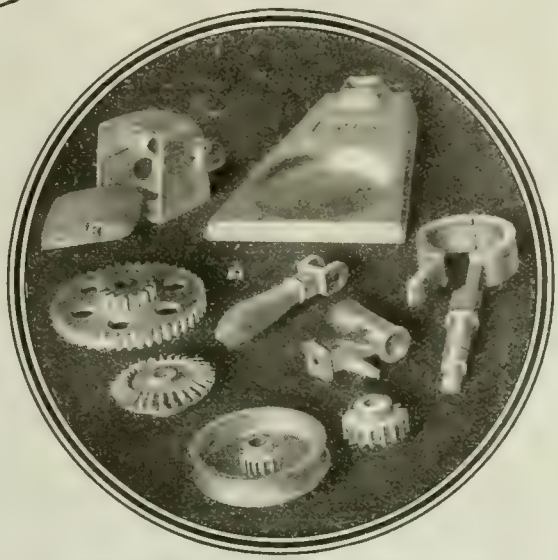
ABC 5th EDITION

AGENTS WANTED

Beacon Engineering Co.
TIPTON, ENGLAND



Franklin Die-Castings for Domestic Devices

Making Housework Easier

HOUSEWORK no longer represents the drudgery of the past. The revolutionizing of every field of labor has affected the home as well as the factory.

The Die-Casting Process has done its share in developing many domestic devices unheard of 50 years ago—such as vacuum cleaners, coffee percolators, and washing machines. These appliances have aided the housewife in her daily tasks, shortened her hours, lightened her duties, and added to her comforts.

In 1892 we originated the Die-Casting Process, and for nearly thirty years we have been reducing costs and simplifying production in many fields of industry. The addition of the Standard No. 12 Aluminum to the Tin, Lead, and Zinc base alloys already in use has enabled us to meet a still wider range of individual needs.

We quote from samples or blueprints. Write for booklet, "Franklin Die-Castings in Many Fields."

FRANKLIN DIE-CASTING CORPORATION
Gifford and Magnolia Streets
Syracuse, N.Y.

FRANKLIN DIE-CASTINGS

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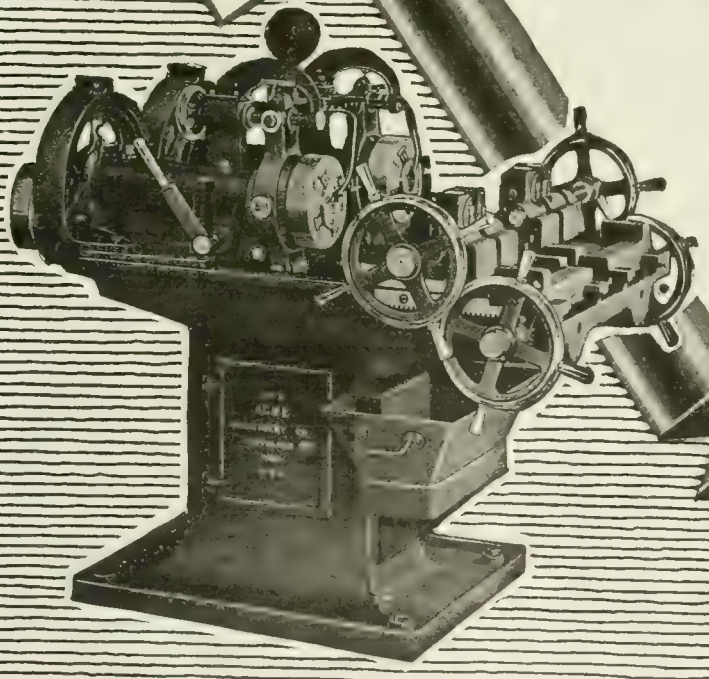
BOLTS

SQUARE · HEXAGON · TEE-HEAD



Cut Them In Your Own Plant

and Save Money on Cost and Delay in Deliveries

ACME BOLT CUTTERS

are made in various sizes for cutting bolts from ¼ to 1 in. diameter. Their heads allow micrometer adjustments while they are in motion. The dies can be changed from one size to another in less than one minute and produce clean, accurate, highly-finished threads.

May we send catalog?

The Acme Machinery Co.

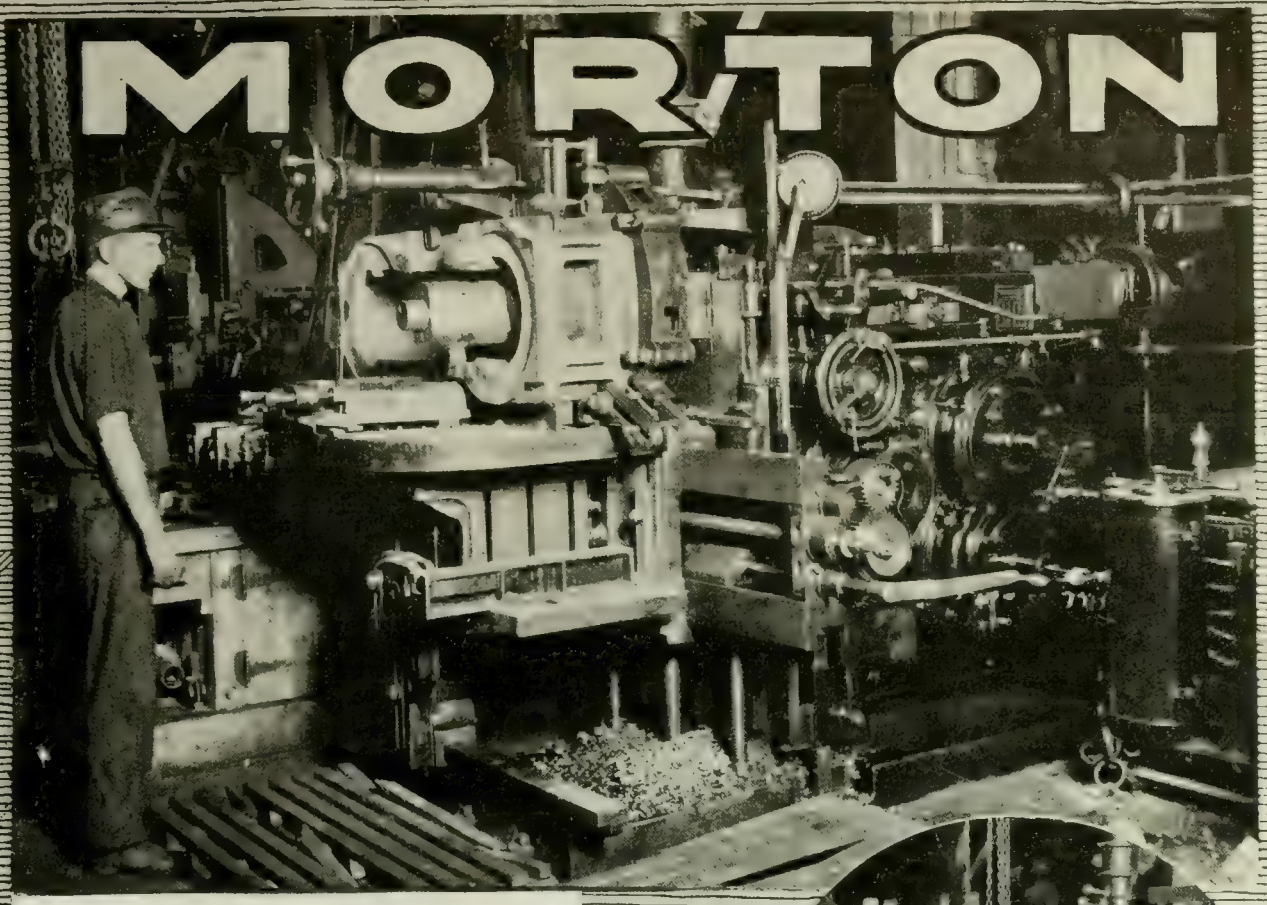
4530 St. Clair Ave. Cleveland, Ohio

We make a complete line of Bolts, Rivet, Heading, Upsetting and Forging Machines, Bolt Cutters, Hot Pressed Nut Machines, Hammer Heads, Bolt Pointers, Nut Tappers.

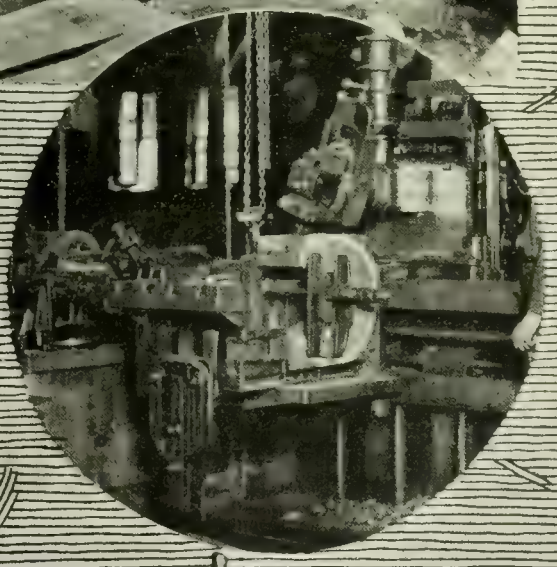
Representatives for Canada:
The John Bertram & Sons Company, Limited, Dundas, Ont.

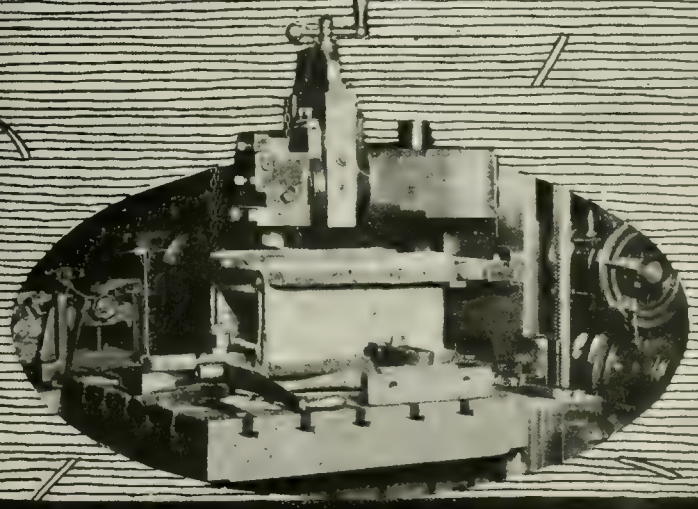
ACME BOLT CUTTERS

MORTON



Increased Driving Box Repairs Forced the Purchase of this Morton Draw Cut Shaper





Delays to output were traced direct to driving box repairs in this busy shop. Time element and shortage of man power were considered and the installation of this "Morton" reflects the good judgment of these thoughtful officials to install machines of guaranteed production power.

This Morton handles all the machine work on driving boxes—planing to thickness, planing shoe and wedge faces and crowning for bearing brass. It simplifies handling and reduces machine time.

May we send Bulletin A-6 explaining numerous points of merit?

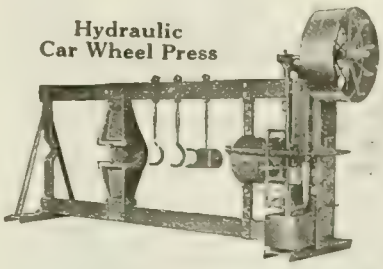
MORTON MFG. CO.

Muskegon Heights - Michigan

LOURIE HYDRAULIC PRESSES

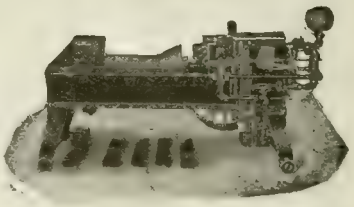
For Every Purpose Requiring Pressure

Hydraulic Car Wheel Press



We manufacture a complete line of presses for bending, straightening, forcing, forming, broaching, welding, baling, and many other purposes.

Hydraulic Bulldozer



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SPRINGFIELD, ILLINOIS, U.S.A.

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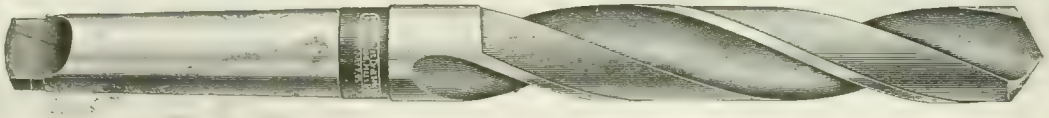
No Argument
You want Good Service



AND

"MORSE" DRILLS

WILL

GIVE IT

Morse Twist Drill & Machine Co.
New Bedford, Mass., U.S.A.

THE MORSE CHAIN CO.

are the
Largest Manufacturers in the world
of
High Speed Silent Chains

Why?

Morse Chain possesses the exclusive
Rocker Joint

Frictionless—Requires no Oilbath.

Jones & Glassco (Reg'd.)
Canadian Agents
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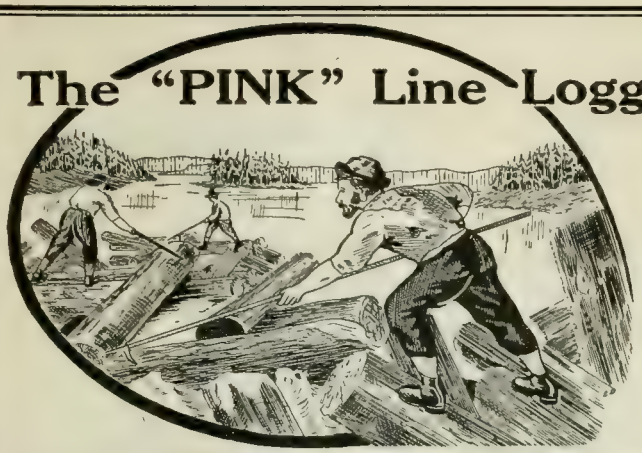
80 H.P. Morse Drive to Rolls, reverses direction every 45 seconds

The "PINK" Line Logging Tools and Handles



MADE-IN-CANADA Products---Headquarters for British Empire for all Lumbering Tools

In every lumber camp in Canada you'll find PINK'S famous lumbering tools. They are the favorites there and have won the esteem of all woodsmen through their superior merit. They are world-renowned and are extensively used in Australia, New Zealand and other countries where the lumbering industry thrives.

EXPORTERS TO EUROPE

We export the same good quality of lumbering tools that have made PINK'S TOOLS a by-word in the matter of good tools in all Canadian lumber camps. Enquiries cordially solicited.

Thomas Pink Co., Limited

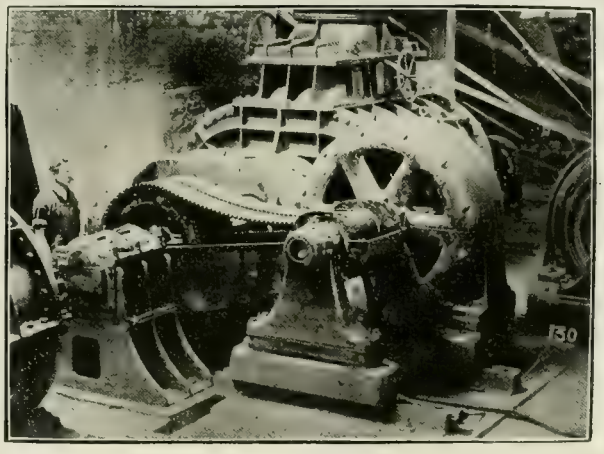
PEMBROKE, ONT., CANADA

RENOLD DRIVING CHAINS

(THE CHAINS OF UNIVERSAL REPUTE)

ONE
QUALITY ONLY—
THE BEST

OUR POLICY SINCE
1879



RELIABLE, COMPACT,
EFFICIENT and DURABLE

Note particularly compact features of 350 H.P. Renold Silent Chain Drive to Roots Pressure Blower.

If YOU are interested in increasing YOUR Production, also improving the Quality of YOUR product, YOU MUST consider

RENOLD DRIVING CHAINS FOR POWER TRANSMISSION

WRITE FOR BOOKLET NO. 200/5—"NOTES ON SELECTION OF CHAIN GEAR."

HANS RENOLD of CANADA, LIMITED

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Three Sizes of

HUNTINGTON STAR DRESSERS

For quick action, and for use on the largest and hardest grinding wheels, the Desmond-Huntington is unequalled.

All Desmond-Stephan Cutters are made of high-grade steel hardened and toughened to give the best results. Write for catalog of the complete Desmond-Stephan line of Dressers.

The Canadian Desmond-Stephan Mfg. Co., Ltd.

HAMILTON - ONTARIO

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Alloy Steels

The manufacture of Commercial Alloy Steels is our business; our plant and organization were designed and built with this idea in mind.

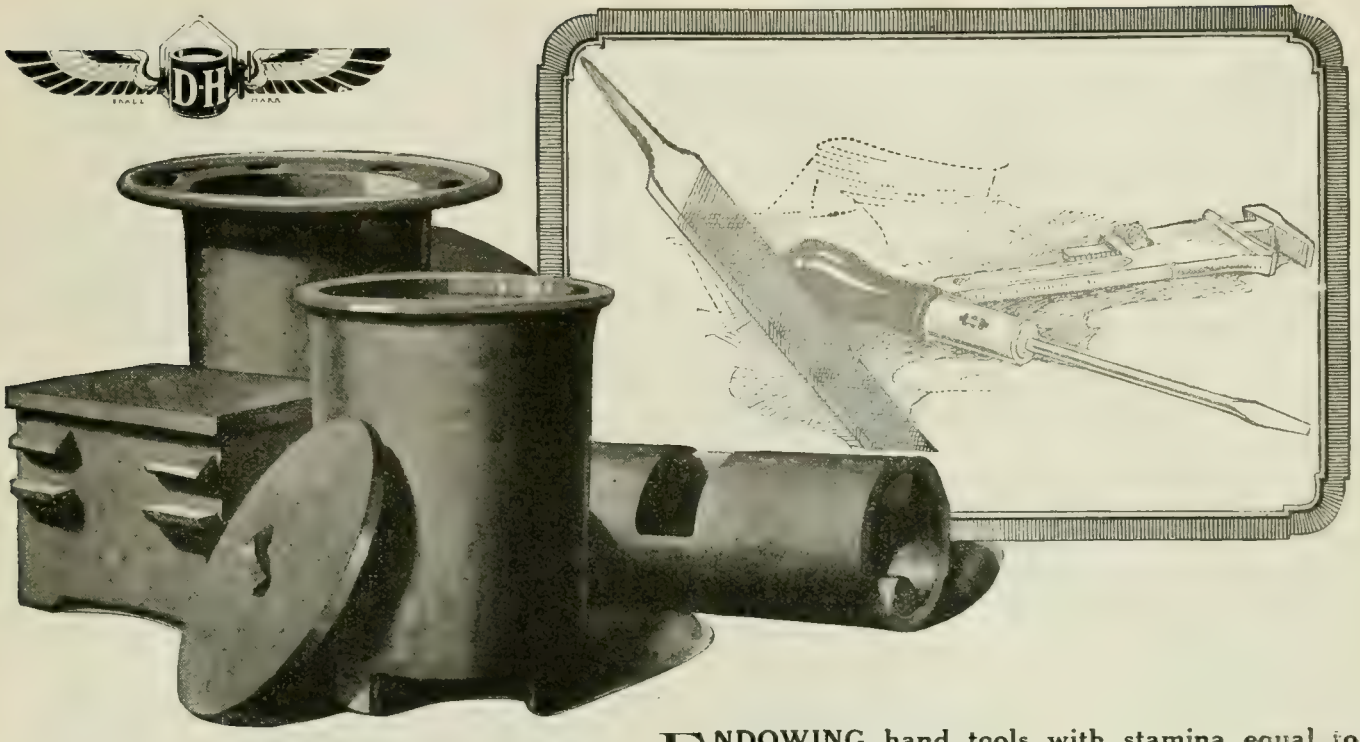
Our experience started with the very beginning of the Alloy Steel industry; we really were the *pioneers* in the manufacture of Commercial Alloy Steels.

One of our ideals is comprehensive service to all steel users; we assist in the selection, treatment and working of Alloy Steels.

Whether you buy steels from us or from someone else, we invite you to avail yourself of our consultatory service.

UNITED ALLOY STEEL CORPORATION
CANTON, OHIO

DETROIT NEW YORK CHICAGO
SYRACUSE INDIANAPOLIS SAN FRANCISCO
CLEVELAND PORTLAND



Putting Backbone into Hand Tools

Bulletin N-21 shows how

Heat Treating Containers of

Cast Nichrome

ENDURE IN HIGH TEMPERATURE

ENDOWING hand tools with stamina equal to the daily use and abuse they get calls for more than haphazard methods of hardening, tempering, annealing, carbonizing, etc.

Manufacturers who have attained the highest average of uniformity in quality, and whose wastage is down to the lowest point, know the value of containers, racks, muffles, retorts, etc., that give uniform service.

This is one reason why the use of Cast Nichrome is constantly increasing. The longer life of Cast Nichrome (guaranteed for thousands of hours at 1800° F.), the shorter heats and lower fuel consumption further contribute to an economy that no man who is responsible for results can resist. Shall we show you some results—and Cast Nichrome Service records?

Manufactured under HENDERSON Patents

CANADIAN DRIVER-HARRIS CO.

WALKERVILLE, ONT.

American Office and Works

Chicago-Detroit Harrison, N. J. England-France

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Is Merchandise Properly *SOLD* To You?

YOU recognize the direct connection between production methods and the cost and quality of the goods; you have a right to know that goods are properly made. Yet the manufacturing, important though it is, is but the first lap on the journey to the consumer. Merchandise must be sold; sales cost is just as legitimate as manufacturing cost, and it has *just as direct a bearing upon the final cost to you.* If needless expense is incurred, it means either higher prices or a decrease in quality or service.

Obviously it will pay you to recognize efficient selling service. With this simple truth clearly in mind, permit us to enunciate an established, proven sales principle—

—The seller who advertises in the Business Papers, reaching *only* the class interested in his message, is using the most direct and economical method of helping you maintain an intelligent contact with your sources of supply.

This kind of advertising bears the same relation to the sales department that an improved machine does to the production department. And if the sales methods are wasteless and efficient, you seldom need worry about the goods. Each acts as a support and stimulus for the other.

On the other hand, the practice of buying circulation by the million in the hope of influencing a few thousand possible customers, is open to question. The best machine is a source of waste when improperly used, and this is no reflection on the machine. Concentration beats scatteration, and costs less. The right tool in the right place is a principle of as much importance to selling as to production.

There are many other reasons why discriminating buyers are giving preferred consideration to the concerns which tell them their business story in the buyer's own business paper, *especially* if that paper has subscribed to the high standards of practice of The Associated Business Papers, Inc.

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Each has subscribed to and is maintaining the highest standards of practice in its editorial and advertising service.

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American Blacksmith
American Exporter
American Funeral Director
American Hatter
American Machinist
American Paint Journal
American Paint and Oil Dealer
American Printer
American School Board Journal
Architectural Record
Automobile Dealer and Repairer
Automobile Journal
Automotive Industries

Bakers Weekly
Boiler Maker
Boot and Shoe Recorder
Brick and Clay Record
Buildings and Building Management
Building Supply News
Bulletin of Pharmacy

Canadian Grocer
Canadian Machinery and Mfg. News
Canadian Railway and Marine World
Candy and Ice Cream
Chemical & Metallurgical Engineering
Clothier and Furnisher
Coal Age
Coal Trade Journal
Concrete
Cotton

Daily Metal Trade
Distribution and Warehousing
Domestic Engineering
Dry Goods Economist
Drygoodsman
Dry Goods Reporter

Electric Railway Journal
Electrical Merchandising
Electrical Record
Electrical World
Embalmers' Monthly
Engineering and Contracting
Engineering and Mining Journal
Engineering News-Record

Factory
Farm Implement News
Farm Machinery Farm Power
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Furniture Merchants' Trade Journal

Gas Age
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Lumber
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Modern Hospital
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Motorcycle and Bicycle Illustrated
Motor Truck
Motor World

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YOUR FURNACE PROBLEMS OUR SPECIALTY

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INVESTIGATE ELECTRIC FURNACES

MELTING
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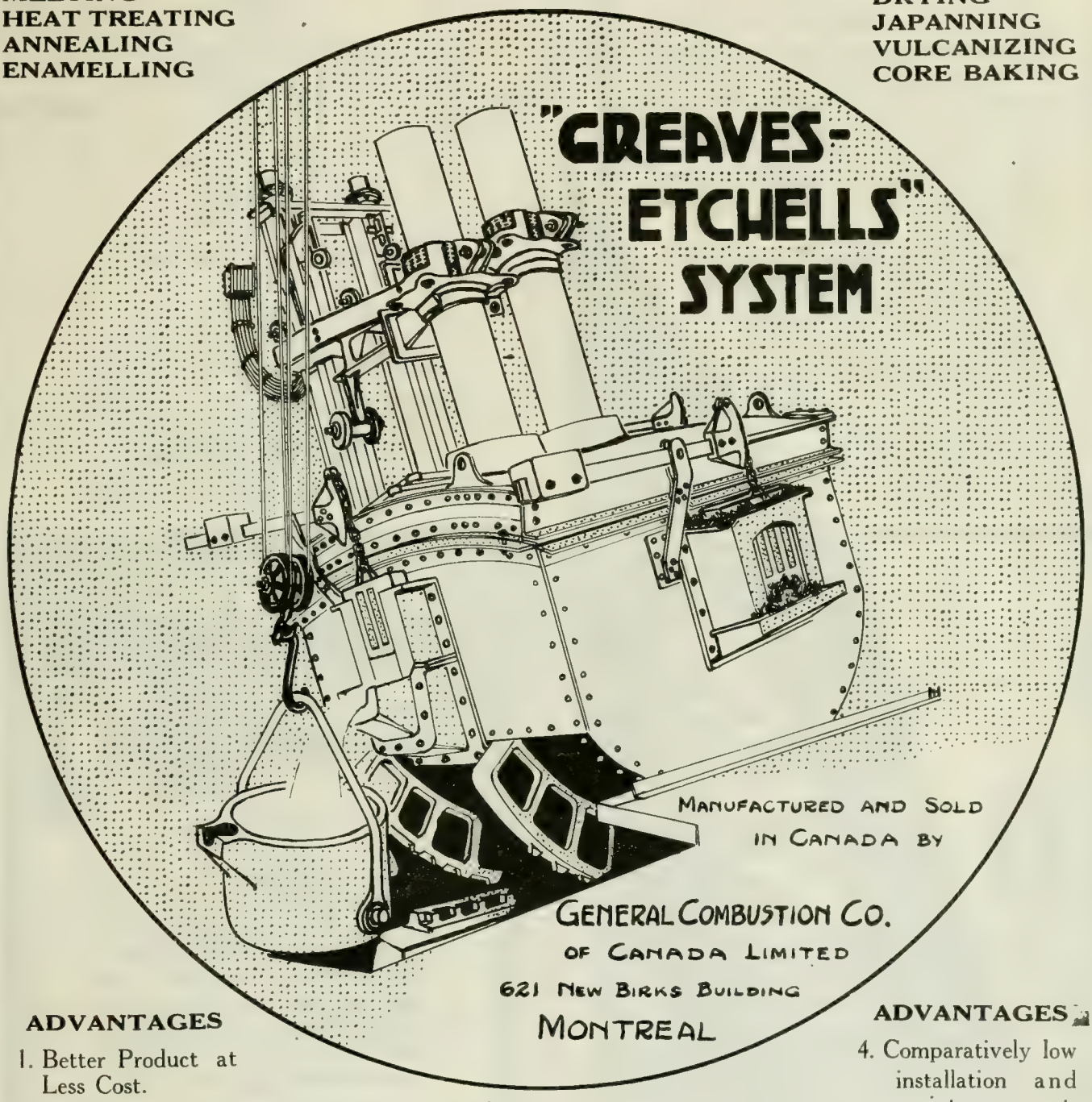

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ADVANTAGES

1. Better Product at Less Cost.
2. Adaptability to all class of material with perfect temperature control—resistance type, 300° F. to 2000° F.; arc type, 2000° and up.
3. Small floor space with ease of operation.

ADVANTAGES

4. Comparatively low installation and maintenance cost.
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7. Ideal shop conditions.

Our staff of highly trained Engineers is at your service, without cost or obligation to you. Consult us.

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The World's most famous Pencils

FOR the clean, even lines of intricate mechanical drawings, or the graduation of tones that make the perfect illustration, there is a VENUS degree that exactly meets the engineer's requirements. VENUS Pencils have set a world standard for exactness and uniformity of grading.

Graphite, washed by a unique process; lead scientifically compressed; selected smooth-grained cedar; always uniform throughout.

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Plain ends, per doz. $1.50
Rubber ends, per doz. $1.75

At stationers and stores throughout the world

American Lead Pencil Co.
238 Fifth Avenue, New York
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The largest selling quality pencil in the world

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and
Lower Operating Costs

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P.H. and IMPERIAL FILES.

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"They Cut Faster and Wear Longer."

Be File-Wise.

INGERSOLL FILE COMPANY, LIMITED.

John Morrow Screw and Nut Company Limited,
Sole Distributors,
Ingersoll, Ontario.

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KELLER-MASTER

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ROTARY GRINDER

Ten pounds lighter, yet more rugged than other types with same power and speed—free from vibration, which insures endurance in operator and tool—ample power to sustain speed under load—are the salient features of the NEW Keller-Master Rotary Grinder.

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High Carbon Steel
Manganese Steel
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Mild Steel

QUALITY GUARANTEED

Sizes—½ lb. to 5,000 lbs. each

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LIMITED
OWEN SOUND, ONTARIO
ESTABLISHED 1860

CANADIAN ATLAS CRUCIBLE STEEL Co. LIMITED

Made in Canada

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ATLAS TOOL STEELS
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Hot Rolled, Forged Blocks and Discs
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THERE is as much difference in the various makes of High Speed Steel as there is in men—

The practice and methods of manufacturers differ widely in every mill and anyone who is at all familiar with the manufacture of High Speed Steel thoroughly understands this

"Red Cut Superior"

The Nationally Known—First Quality

HIGH SPEED STEEL

is the best for all Machine Work

ARE YOUR TOOLS MADE OF "Red Cut"?

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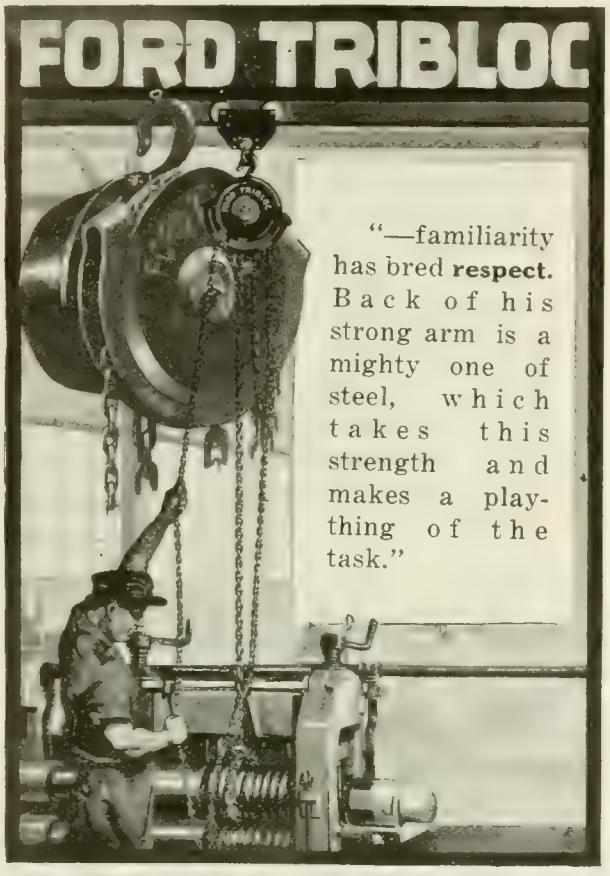
FORD TRIBLOC
"—familiarity has bred **respect.** Back of his strong arm is a mighty one of steel, which takes this strength and makes a plaything of the task."

Each Man a Giant

His strength, magnified, is the power that holds each mighty load. Crushing weights are mere playthings in his grasp. He handles them with confidence, knowing that his ally cannot fail.

Men are conscious of this power. They know that each movement of the hand chain will result in raising or lowering the load. They work with confidence, knowing that their FORD TRIBLOC cannot fail.

TRIBLOCS are all equipped with a Loop Hand Chain Guide, which prevents the hand chain gagging or overriding the flange. A FORD TRIBLOC may be worked from any angle, with speed, efficiency, and safety. You could doubtless use one or more. Let us send you prices.

FORD CHAIN BLOCK CO.
2ND & DIAMOND STREETS PHILADELPHIA, PA.

OVER SEAS REPRESENTATIVE
ALMACOA ALLIED MACHINERY COMPANY OF AMERICA ALMACOA
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PARIS BRUSSELS TURIN BARCELONA RIO DE JANEIRO

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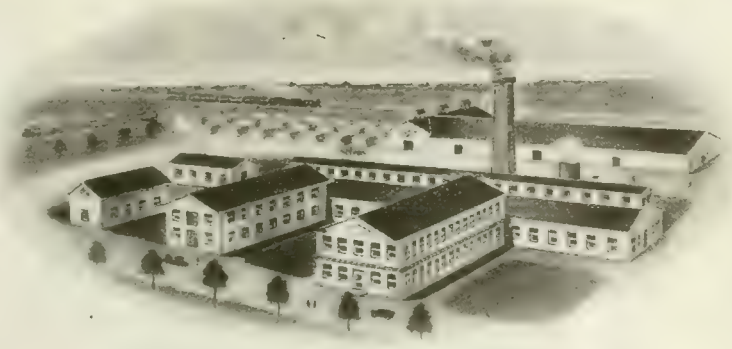
"BERNARD"
TRANSMISSION APPLIANCES



Put them to the test

have achieved an enviable reputation in the Industrial World. Their performance under every conceivable working test has proved their dependability, and they are the most economical because of their durability.

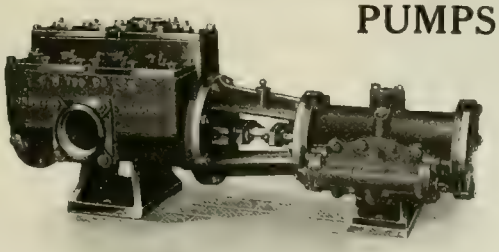
We stand back of our products and will give Dealers every assistance.

The A. Bernard Industrial Co.

Manufacturers of High-Grade Power Transmission Appliances
Offices and Works: FORTIERVILLE, Que., Canada

HEPBURN

VACUUM PUMPS



Self-Draining--Efficient

Hepburn Patent Vacuum Pumps are the only Self-Draining Pumps made in Canada. Note the simple, sturdy construction of the Pump above. There are no levers, no tappets and the long strokes produce an efficiency not attainable with pumps of shorter strokes. Let us give you fuller particulars.

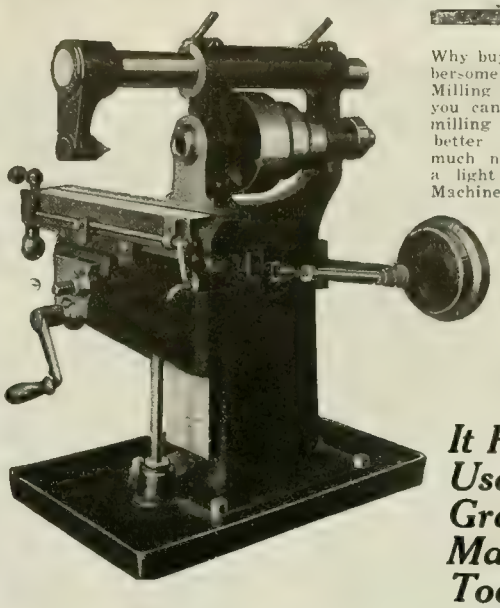
We have other lines—Vertical Engines, Winches, Cut Gears, Power Presses, Derricks, Cranes, Brick Machinery, Blacksmith Work, Acetylene Welding and General Machine Work.

JOHN T. HEPBURN, LIMITED

Engineers and Iron Founders

18-60 Van Horne St., Toronto, Ontario

This Power Feed Miller $220



Why buy a heavy, cumbersome and expensive Milling Machine, when you can do your small milling operations to better advantage and much more rapidly on a light Burke Milling Machine?

Catalog shows other sizes of Milling Machines with hand or power feed, with or without overhanging arm, either bench or column type.

It Pays to Use High Grade Machine Tools

THE BURKE MACHINE TOOL CO.

520 Sandusky St., Conneaut, Ohio, U.S.A.

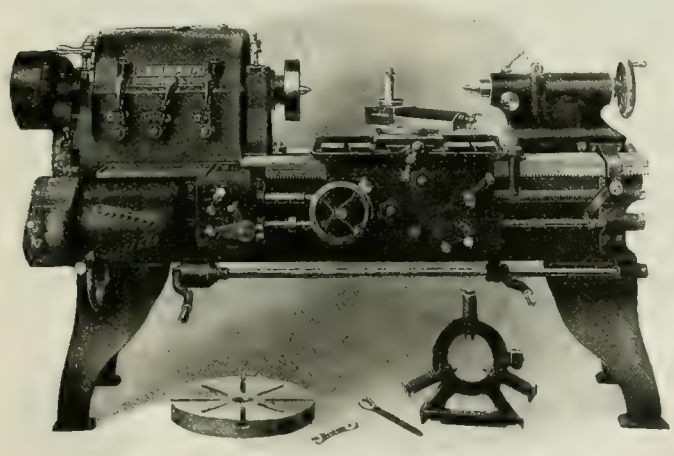
Canadian Dealers:—H. W. Petrie Ltd., National Machinery & Supply Co., A. R. Williams Machinery and Supply Co., Canadian Fairbanks-Morse Co., Williams & Wilson, Garlock-Walker Machinery Co., Yeates Machinery Co., Cope & Sons, Geo. F. Foss Machinery & Supply Co.

The "Lehmann" Improved Selective Head Lathes

(Patents Pending)

SIZES—14" to 24" SWING

On account of its simplicity of construction, great driving power and rigidity, ample range of speeds, moderate tooth travel of its gears, compact and shapely appearance, the "LEHMANN" Selective Head Engine Lathe stands to-day in a class *ahead* and *alone*. Some of the features of construction are:



Sixteen Spindle Speeds in correct geometrical progression obtained with the use of only ten gears.

Improved Friction Clutches (Patents Pending) running in oil, requiring no adjustment and giving forward and reverse control to spindle.

Heat-treated or Hardened Steel gears.

All Shafts, except spindle, running on ball bearings.

Spindle of alloy steel, hardened and ground at the bearings and running in phosphor bronze boxes.

Head Casting forms oil-tight case enclosing all running parts.

In addition these lathes embody all features such as the patent quick change mechanism, the tailstock spindle locking device, the rod and screw shift, etc., forming part of the "LEHMANN" Cone Head Lathes which have acquired an enviable reputation for accuracy and production.

Let us describe more fully this Exceptional Lathe and its Distinctive Advantages

Lehmann Machine Company - St. Louis, U.S.A.

Chouteau Avenue at Grand

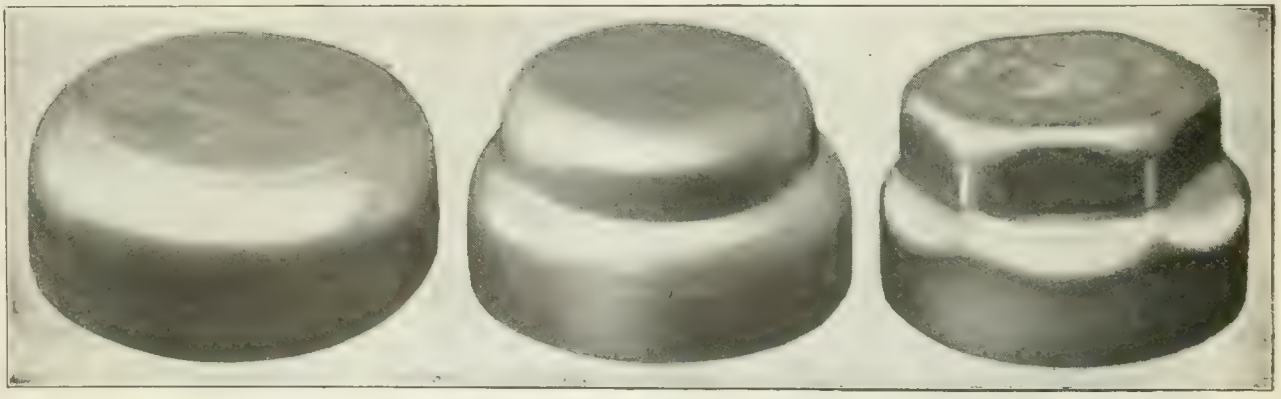
If interested tear out this page and place with letters to be answered.

Forming Hub Caps—Three Operations

Hub Caps for Velie Motor Cars are blanked, drawn and embossed in three operations on "BLISS" No. 76½ Straight Side Presses in the shop of Worcester Pressed Steel Company, Worcester, Mass.

The illustrations show the three stages of this process. The first shows the shell after blanking and first draw, the second shows the shell after cupping, the third shows the shell after the final operation of forming the hexagonal sides and embossing the end.

Production rate 900 per hour, each operation.



BLISS 1857

E. W. Bliss Company

Main Offices: BROOKLYN, N. Y., U. S. A.

American Factories: BROOKLYN, N. Y.; HASTINGS, MICH.; CLEVELAND, O.; SALEM, O.

BLISS 1921

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No. 128

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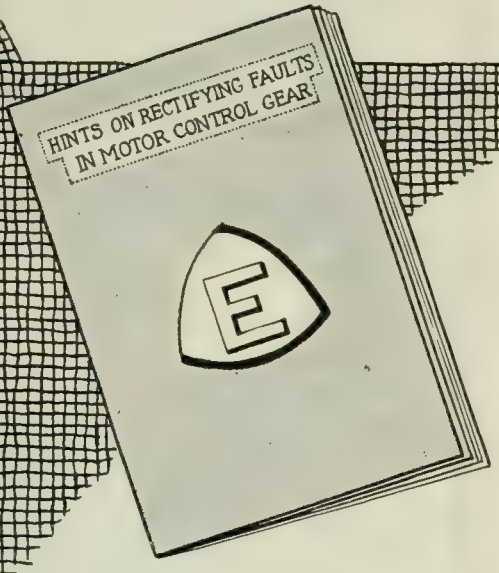
should write for a copy of this Booklet



A Manufacturer's Publication

Packed full of practical wisdom and knowledge based upon prolonged experience, designed expressly to furnish the maximum amount of information to the reader who uses the apparatus of which it treats.

Extract from Electrical Review (London)

Write for Hints Booklet "C"

GEORGE ELLISON

Mechanical and Electrical Engineers
Makers of Electric Control Gear

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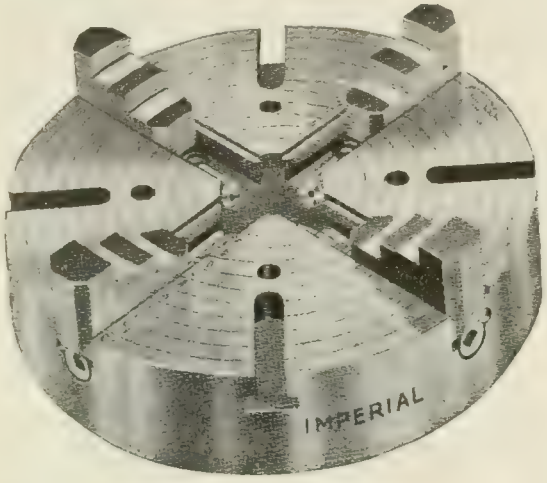
Highly Endorsed by Canada's Best Manufacturers

Sturdy long-wearing "Made-in-Canada" Chucks that are making good everywhere.

Specify them in your next order.



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BRANTFORD, Ont. LIMITED

Wood Screw Making Machinery

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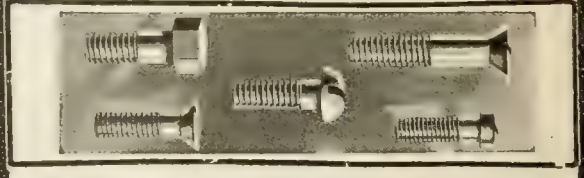
Series



For sixty years we have constantly manufactured machinery for making screws, always studying to improve and refine our product.

Write or Wire us.

Cable address: "Cook,"
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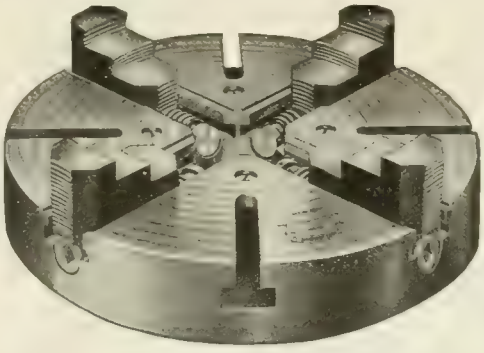
Codes: Liebers
Western Union

Asa S. Cook Co.
Hartford, Conn.

ALL STEEL

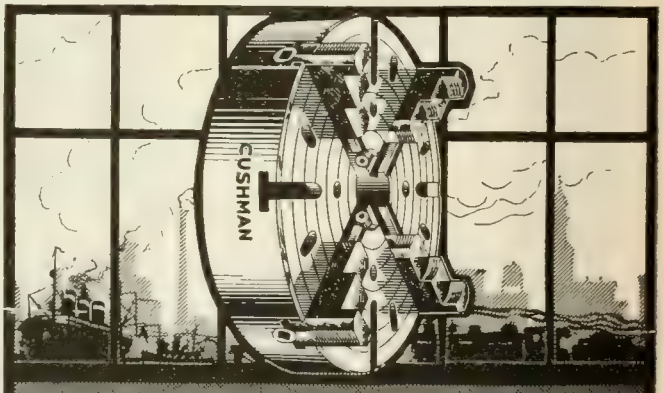
INDEPENDENT CHUCKS

are not an experiment — they have come to stay. They are a necessity with the modern machinery and high-speed steel cutting tools.



THE UNION STEEL BODY CHUCKS
are well designed and have all the elements of strength and durability for which they are designed. We make other types in steel also, including the Geared Scroll Chucks and the Geared Scroll Combination—all designed for heavy work and hard usage.

UNION MANUFACTURING COMPANY
New Britain, Conn.
New York Office: 26 Cortlandt Street
Makers of a complete line of chucks



THE CHUCK WITH A REPUTATION TO MAINTAIN

"CUSHMAN" CHUCKS 1862

THE CUSHMAN CHUCK CO.
HARTFORD, CONN.

NAMCO
DIES & TAPS

The men who build NAMCO Tap and Dies know that the cutting of accurate threads continuously is one of the big problems of every shop foreman.

That is why the best material and careful workmanship go into every NAMCO Threading Tool—in order that each and every one shall be "built for service."

The National Acme Company
Cleveland, Ohio

New York, Boston, Chicago,
Detroit, Buffalo, Windsor, Vt.
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CATALOG?

Built for Service-

LEARNED From EXPERIENCE

WHEN *ARMSTRONG* earned his living by RUNNING A LATHE he often wished he could get a set of Lathe Dogs which would stand up to the work. The Screws especially were a constant source of trouble, points upsetting and threads stripping.

His practical experience is the basis upon which the *Armstrong* line of Dogs and Clamps is built. The bodies are Drop Forged of a special grade of steel selected for its high degree of stiffness and great tensile strength. Screws can't be beat for long lasting qualities; they are made of Chrome-Nickel Steel, given a special heat treatment, and the points are hardened.

Specify Armstrong when ordering and get the best.

Catalog mailed free upon request.

ARMSTRONG BROS. TOOL CO.
"THE TOOL HOLDER PEOPLE"
306 N. FRANCISCO AVE. CHICAGO, U.S.A.
STRONG STRONG

SHEPARD
ELECTRIC CRANES & HOISTS

Shift to a "Shepard"—

Put your rehandling—"picking up," carrying, and "putting down" in the hands of ONE MAN, the operator of a Shepard Electric Crane or Hoist. Release the "gang" for productive activity.

Rehandling with a "Shepard" means economy, speed, and efficiency, otherwise unattainable.

Shepard Engineers are capable to advise you in the selection of the proper hoisting and carrying equipment for your plant. Their services do not obligate you.

Shepard Electric Traveling Cranes are made in capacities of 1 to 50 tons; Electric Hoists ½ to 30 tons.

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2135-S

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TRADE MARK REG. U.S. PAT. OFFICE
STEEL BELT LACING
Best for Every Type of Belting
Nothing Needed But a Hammer
The Strongest Belt Lacing On Earth
Double Staggered Teeth Insures Strong and Firm Grip
"Never Lets Go"
Reg. U.S. Pat. Office

How the "ALLIGATOR" Line Builds Business for Jobber and Dealer

Read these features on which ALLIGATOR Steel Belt Lacing will increase your sales to users of power and conveyor belting.

ALLIGATOR Steel Belt Lacing is easy to apply. Requires no tool but a hammer and only three minutes average time. Anyone can put it on.

Makes a permanent hinged joint **that can be run on both sides,** and works equally well on **any** size or kind of belting from tape to ⅝-inch thickness.

The staggered teeth (see illustration) penetrate lengthwise through the belt and clinch on to the sides leaving burden carrying fibres intact. The sectional rocker hinge pin is serviceable under all conditions.

Everywhere in all industries where belting is used, ALLIGATOR is chosen because of its superiority over other types. The decision of hundreds of thousands of belting users influence you to stock it. ALLIGATOR, the best lacing proposition for the trade.

Besides these reasons: Quick application, belt saving powers, economy and general satisfaction—ALLIGATOR Steel Belt Lacing is being brought to the attention of master mechanics, shop superintendents, purchasing agents, etc., in a large list of national and local publications devoted to various commercial and industrial pursuits.

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Steel LAMP GUARDS

Protects the lamps from breakage and theft — property from fire. An efficient, inexpensive security against danger, losses and delays. Made in all styles and sizes with reflectors and handles if desired. Patent lock prevents theft. Sold at a distinct economy to the purchaser. Write on letterhead for free samples, price, etc. Not in stock in London

A size and type for every power or conveyor belt. Write on letterhead for samples and trade prices.

FLEXIBLE STEEL LACING CO.
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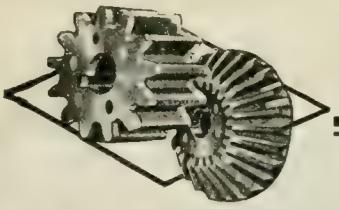
135 Finsbury Pavement, LONDON, E.C., ENG.
Stocked by the Best Supply Houses throughout Canada



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that give better Service

THE secret of the universal satisfaction given by Diamond Fibre Gears is in the special grade of Fibre used in their manufacture. Its dense mixture, high tensile strength, unusual wearing qualities, low cost and slight elasticity make it a wonderfully serviceable gear material.

Diamond Fibre Gears are noiseless. They combine the efficiency and regularity of an all-metal gear-drive with the silent, smooth operation of a belt transmission. In your own interests be sure to specify

DIAMOND FIBRE GEARS

New uses for Diamond Fibre are being discovered daily in the industrial, mechanical and electrical field. Even if you cannot think just now in what possible way Diamond Fibre can interest **you,** let us send you our new illustrated catalog. It is interesting and instructive and may show you some way in which the use of Diamond Fibre will decrease your production costs and increase your production.

Your copy is ready now write for it

DIAMOND STATE FIBRE COMPANY OF CANADA, Limited

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TORONTO
CANADA

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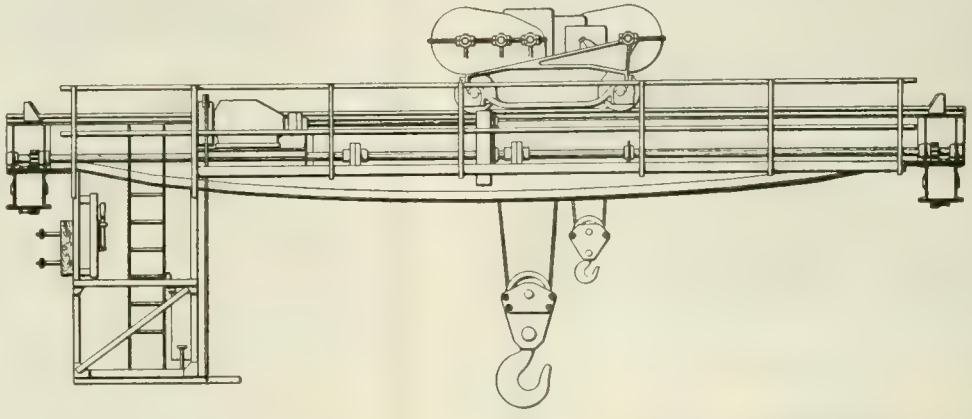
CRANES

ELECTRIC AND HAND OPERATED



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HEAD OFFICE & WORKS: MONTREAL BRANCHES:-OTTAWA, TORONTO, WINNIPEG

HYDRAULIC TURBINES AND PUMPS

Our shops are equipped for building TURBINES of the largest sizes —also high speed PUMPS of large capacity for medium and low heads. Two turbines of 20,000 H.P. are now under construction.

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Pulp Drying Machines.
Millspaugh Suction Rolls.
Millspaugh Shower Pipes.
Davies Oscillating Suction Boxes.
Press and Felt Rolls.
Brass Covered Rolls.
Pulp Digestors.
Barking Drums.
P.A.P.A. Screens (Spangenburg System) for pulp and paper.

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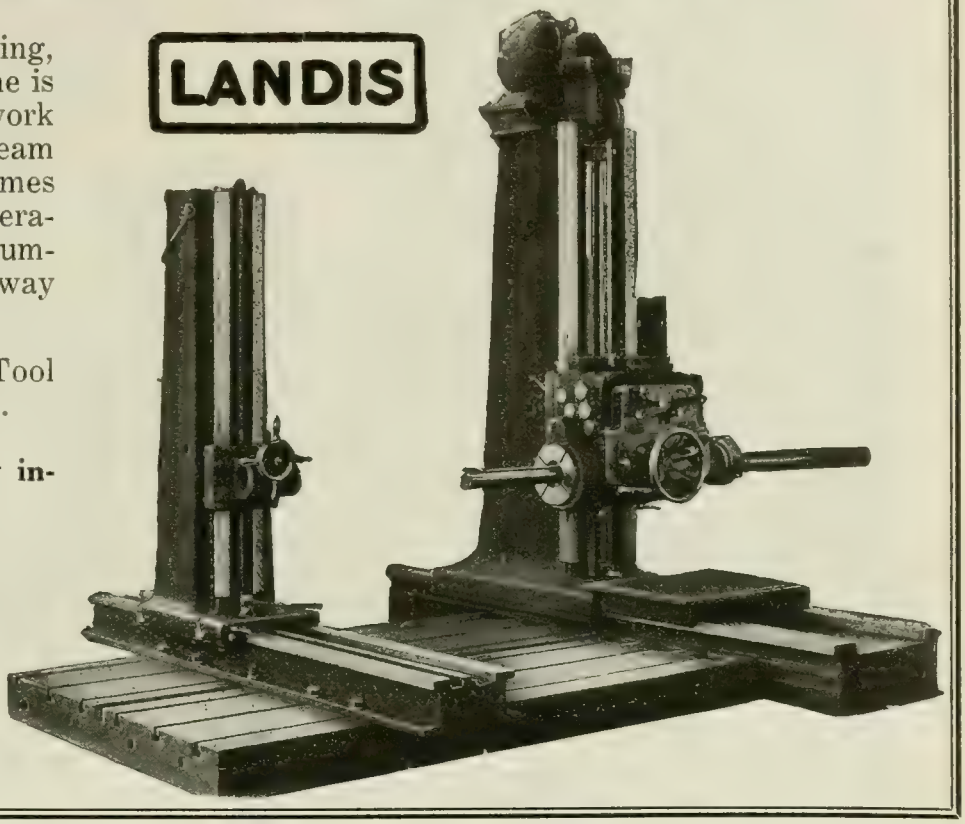
General Adaptability

The Landis Horizontal Boring, Facing and Milling Machine is especially useful for such work as boring cylinders for steam engines, pumps, engine frames and a great variety of operations found on heavy and cumbersome castings in railway shops and ship yards.

You will like this Landis Tool because it produces results.

Our catalogue gives many interesting details.



Landis Tool Company
Waynesboro, Pa.
New York Office: 51 Chambers Street

AGENTS:
Dewstoc Machine Co., Birmingham, Ala.; Harron, Rickard & McCone, San Francisco and Los Angeles.

Open a Bank Account in Canada

The present abnormal exchange situation between Canada and the United States is affecting trade relations between the two countries. Exporters in the United States can meet this by opening Bank Accounts in Canada.

This Bank has 727 Branches, of which 625 are located in Canada from the Atlantic to the Pacific Coast. Write for a complete list of Branches and for terms respecting a Canadian account.

THE ROYAL BANK OF CANADA

Capital and Reserves $40,000,000 **Total Resources $544,000,000**

Head Office: **MONTREAL**

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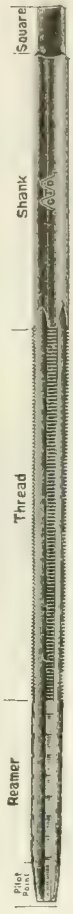
One Man at the Air Drill

IN the boiler shop of the Canadian plant of a great American industry the men said no staybolt tap made could be driven easily enough to require but one man at the air drill —said they'd strike before they'd obey the order to use only one man on each staybolt tap.

But the answer came back from headquarters in "The States" that the *"Maxi"* Staybolt Tap made by the GTD Corporation was different; that only one man was needed and that only one man must be used in Canada.

Headquarters even sent photographs to prove their statement but they thought the photos must be fakes, and so the Railroad Union sent a committee to see it done—and they saw and were convinced.



This is one of the best arguments we can give you on the *"Maxi"* Staybolt Tap. The saving in labor is not the only argument that there is, however.

The *"Maxi"* Staybolt Tap has the *exclusive* features of a *pilot point*, which finds the hole in the inner plate immediately, and guides the tap into it—a *chip breaker*, which prevents accumulation and wedging of chips —an extra long taper threaded section—specially designed flutes.

Consequently the *"Maxi"* cuts many more threads than any other staybolt tap on the market.

Let us tell you more about this remarkable tool. Clip the coupon and send it in. No obligation, of course.

GREENFIELD TAP AND DIE CORPORATION
OF CANADA, LIMITED GALT, ONTARIO

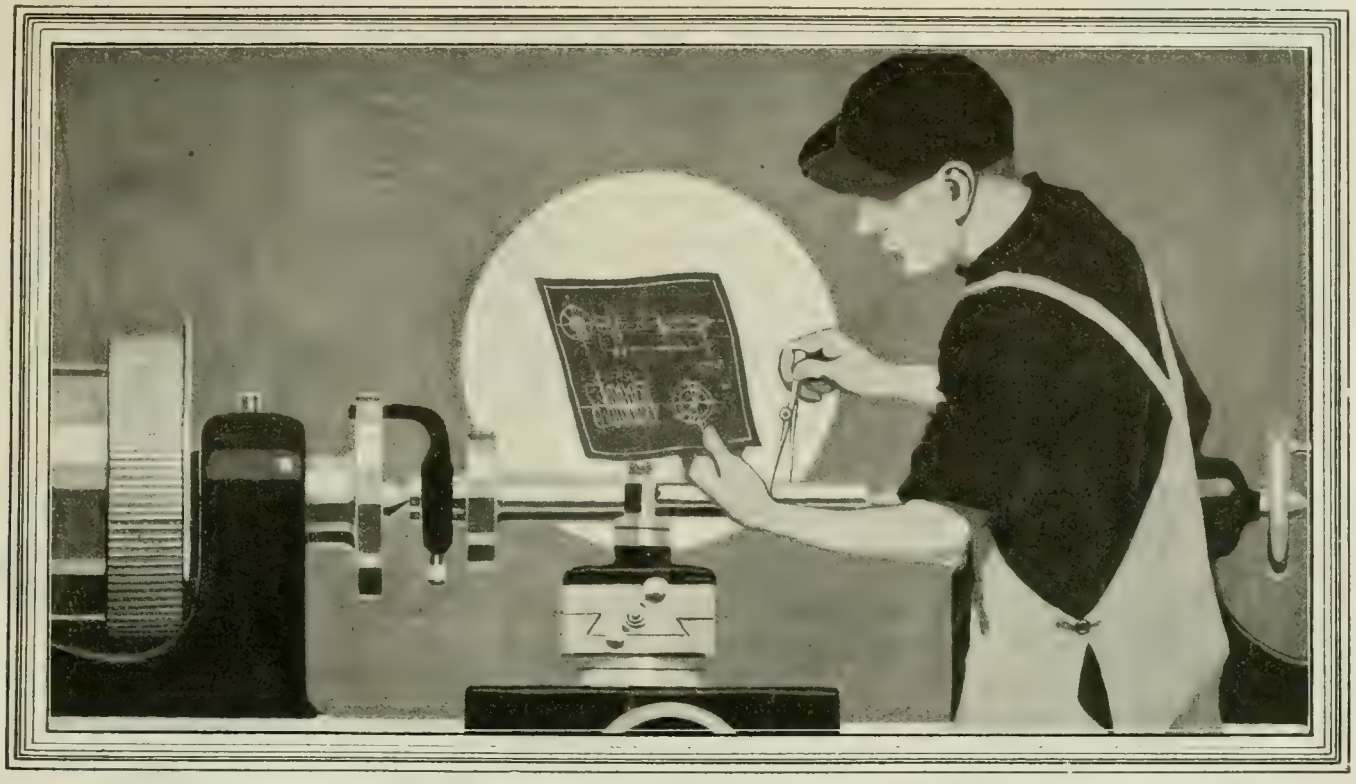
Successors to
WELLS BROS. CO. OF CANADA, LIMITED
London Office: 139 Queen Victoria Street, E.C. 4

GTD Screw Plates, Taps, Dies, Reamers, Gages, Pipe Wrenches.

GTD
Corporation of Canada, Limited, Galt, Ontario

I am interested in cutting threading costs on boiler work. Please send me your circular the *"Maxi"* Tap and put my name on your mailing list to receive additional screw-threading information as issued.

Name _____
Position _____
Firm _____
Address _____ C.M. 204



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Hours and often days are thus saved in putting work into and through the shop.

In the office, too, the Photostat is invaluable because it makes facsimile copies of blue prints, maps, charts, progress sheets, sales sheets, advertising layouts, etc.

Send for our booklet in which some of our customers tell in their own way how the Photostat is used both for standard and special work.

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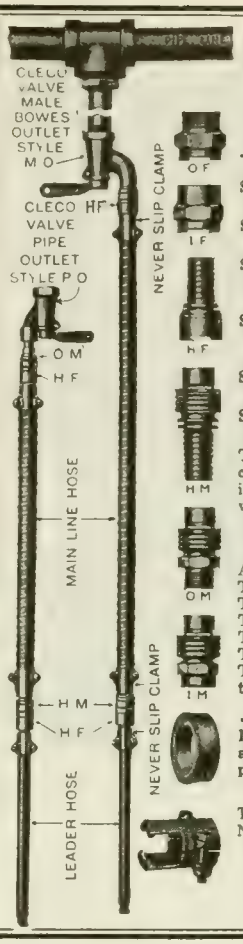

Cleco Pressure-Seated Air Valves

Bowes Air Hose Couplings—Cleco Never Slip Hose Clamps and Cleco Grooved Hose Nipples and Hose Clamp Tool

STYLE O.F. is an Outside Thread Female Pipe End. Made in sizes ⅜-inch to 1½-inch.

STYLE I.F. is an Inside Thread Female Pipe End. Made in sizes ¼-inch to 1½-inch.

STYLE H.F. is a Female Hose End with spiral shank to insert into the hose and has groove for the Never Slip Hose Clamp. Made in sizes ¼-inch to 1½-inch.

STYLE H.M. is a Male Hose End with spiral shank to insert into the hose and has groove for the Never Slip Hose Clamp. Made in sizes ¼-inch to 1½-inch.

STYLE O.M. is an Inside Thread Male Pipe End. Made in sizes ¼-inch to 1½-inch.

STYLE I.M. is an Inside Thread Male Pipe End. Made in sizes ⅜-inch to 1½-inch.

The Male and Female Ends of Bowes Couplings interchange in sizes ¼-inch to ¾-inch. Sizes 1-inch and 1¼-inch interchange. The 1½-inch ends interchange only with themselves.

BOWES COUPLINGS

Are instantly connected or disconnected.
They are absolutely air-tight under all pressures.
They quickly pay for themselves by stopping costly leaks.
They interchange in sizes most commonly used.
They have no loose parts to be mislaid or lost.
They are made of brass and will not rust.
The U-shaped Gasket interchanges in couplings ¼-inch to ¾-inch.

CLECO VALVES

Style P.O.

Style M.O.

Style A.

Style P.O.—Made in sizes ¼ in., ⅜ in., ½ in., ¾ in., 1 in., 1¼ in., 1½ in., 1¾ in., and 2 in. Pipe Outlets. Inlets are one pipe size larger.
Style A—30° Angle Valves, are made in sizes ½ in., and ¾ in.
Style M.O. Valve—Has 1 in. Inlet and Bowes Coupling Outlet. Connects with Bowes sizes ¼ in. to ¾ in.

CLECO GROOVED HOSE NIPPLES

Grooved Nipples when attached to the Hose with Wire Clamps as illustrated cannot "blow out." Wire clamp tool shown below applies the wires to hose.

The Lightening Hose Clamp Tool illustrated applies wire clamps at a cost of 1½ cents each.

In stock: Riveting and Chipping Hammers, Air Drills, Emery Grinders, Sand Rammers, etc.

Use Annealed Wire No. 14

IMPORTANT:—The Small Leaks in your "AIR LINE" mean serious loss in DOLLARS. Have you any idea of the amount of "Air" wasted in small leaks at your connections? Air Leakage through 1-16 in. opening equals 5.32 cu. ft. per minute at 80 lbs. It will pay you to install Bowes Couplings and Cleco Valves, which will stop costly leaks.

Bulletins Nos. 43, 44, 46 and 48 mailed on request.

THE MODEL HOSE LINE illustrated shows correct styles of couplings and valve to use and proper way to attach the Cleco Never Slip Hose Clamps to Bowes Couplings. No "blow-offs" can occur when "Cleco" Clamps are used.

CLEVELAND PNEUMATIC TOOL CO. OF CANADA, LIMITED

84 Chestnut St., TORONTO, ONT. 337 Craig St. W., MONTREAL, QUE.

TRADE MARK

MAGNOLIA ANTI FRICTION METAL

TRADE MARK

New Truths and Old Fallacies

Hardness of Alloys—*Continued*

We have referred several times to the compression test of alloys made by the American Society for Testing Materials, and we give the figures below:

No.	FORMULA Copper	Tin	Antimony	Lead	Deformation of Cylinder 1¼" dia. x 2½" high, at 70 Tons At 1,000 lbs. per sq. in.	At 5,000 lbs. per sq. in.
1	11½	91	4½		0.0000	0.0010
2	5½	89	5½		0.0000	0.0015
3	8 1-3	83 1-3	8 1-3		0.0010	0.0045
4	5	75	12	10	0.0005	0.0025
5	2	65	15	18	0.0010	0.0030
6	3½	20	6	70½	0.0015	0.0050
7		10	15	75	0.0010	0.0050
8		5	15	80	0.0020	0.0090
9		5	10	85	0.0040	0.0120
10		2	5	93	0.0010	0.0100
11			5	95	0.0010	0.0100
12			10	90	0.0025	0.0170

In analyzing these figures it should be remembered that metals have no ultimate crushing strength, as they spread when the load goes beyond a certain point; also that tin base metals are more resilient than lead base metals and that the former will resume their original form, partially or altogether, when the pressure is removed, whereas a lead base metal will become permanently set under a comparatively light load, and the value of the above figures are somewhat dependent upon whether measurements were made before or after the load was removed. This thought was suggested by the apparently anomalous difference shown between formulas Nos. 1, 2, and 3. If formulas 1 and 2 did not resume their original form under the 1,000 lbs. pressure and partially resume it under 5,000 lbs., then all preconceived ideas are upset as to the value of copper as a hardener, as shown by comparison with the No. 3 formula, which contains a greater quantity of both copper and antimony.

(Continued next month)

For Copy of complete article :
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Office and Factory :
37-39 Shannon Street, Montreal, Que.

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THE NIAGARA ARBOR PRESS

A good press—Canadian made

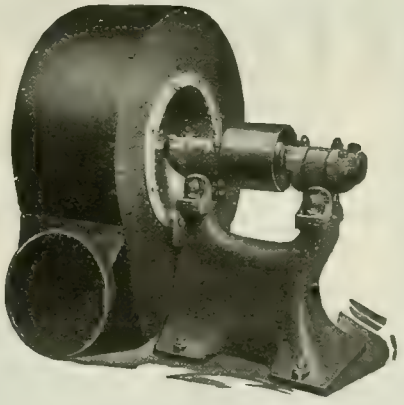
Ideal for the machine shop; easy to operate, rigid and powerful. Only the best materials are used in its construction. Can be furnished with or without base as required.

Buy your presses in Canada. The "Niagara" is guaranteed the equal of *any* imported press—and its price is lower.

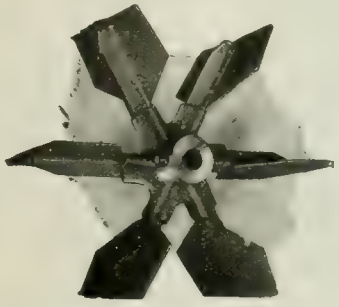
L. & P. Manufacturing Company, Limited
Niagara Falls, Ontario

"CANADIAN" MILL EXHAUSTERS

Handle Any Material



The Canadian Standard Mill Exhausters will handle any kind of material efficiently—sawdust, shavings, cotton lint, or stringy material, gases, fumes, smoke, etc.



They are adjustable to any angle of discharge instantly—have universal type of wheel and carefully constructed, self-aligning oil-ring bearings.

Catalog 410-77—gives technical data and prices. Write for a copy.

Canadian Blower & Forge Co. Ltd.
KITCHENER, ONT.

If interested tear out this page and place with letters to be answered.

THE TUBE COMPANY OF CANADA LIMITED

Electric and Oxy-Acetylene
WELDED TUBING
Also BUTT SEAM TUBING

We have a thoroughly equipped plant for Welding by Electric and Oxy-Acetylene processes. Butt Seam Tubing is also one of our specialties. Tubing made hot or cold rolled finish.

Our Work Includes Tubing for

Bicycles, Bedsteads, Automobile Parts, Electric Fixtures, Gas Fixtures, etc. Round, Square, Rectangular and Special Shapes. Sizes ⅜ in. to 2 in. outside diameter, from 16 to 22 gauge. Also equipped for bending 16 gauge or lighter, any shape or radius. Let us advise you of the kind of tubing that will best suit your requirements.

INQUIRIES GLADLY ANSWERED

The Tube Company of Canada LIMITED

233 Dufferin Street, TORONTO, Canada

Hull Iron and Steel
Foundries, Limited *Hull, Quebec*
Steel, Chrome, Manganese and Nickel Steel Castings

Annealed and Unannealed

Cement Mill and Mining Machinery Castings, Stamp Mills, Crushing Plants, Excavating Outfits, Steel Car Wheels, Locomotive Driving Wheels and Frames, etc.

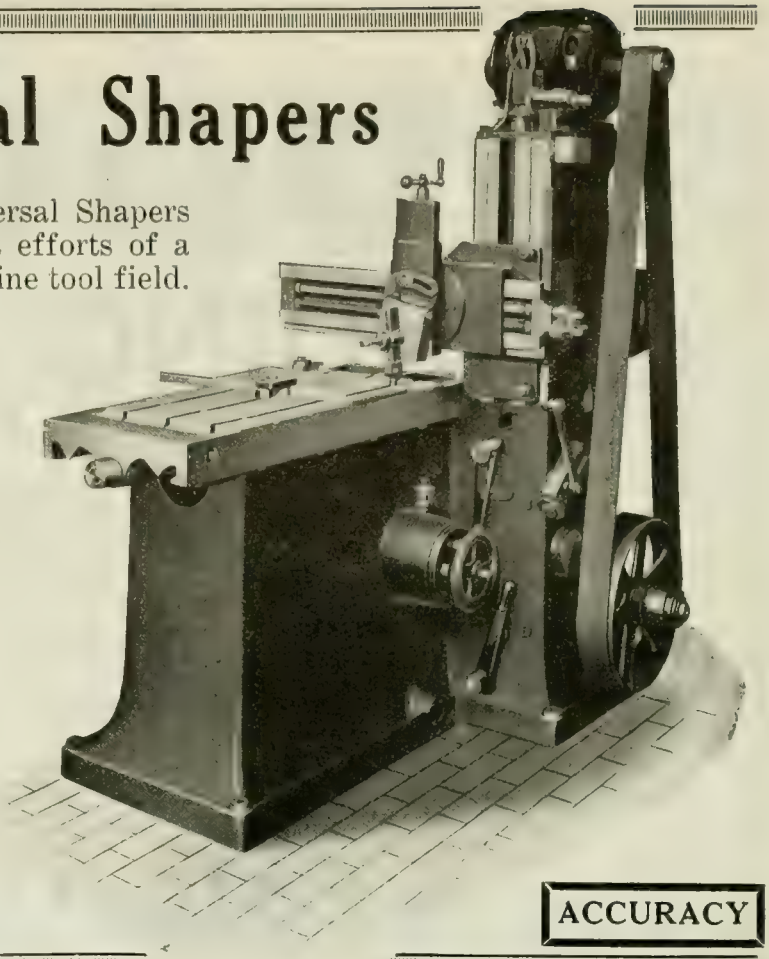
Machine-Moulded Gears

"HISCO" machine-moulded gears, while requiring no pattern, insure accuracy, dependability, quality, and the price is minus the cost of patterns—which in these days of high prices of lumber is something to be considered.

Specify "HISCO" Products

24-inch Universal Shapers

Into the design and construction of Universal Shapers have gone the united knowledge and best efforts of a staff of specialists in the tool, jig and machine tool field.



Consider these features—

It planes parallel in the heaviest cuts.

It planes accurately—horizontally as well as vertically.

It handles efficiently a wide range of shaper and planer jobs—particularly those considered awkward by **both** these machines.

Operator can reach all adjustments from working position.

Have you full particulars?

Universal Machine & Tool Company

Canton, Ohio, U.S.A.

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STEEL *for*

Every Commercial Purpose

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

Steel Ingots
by the
HARMET
Liquid Process

Nova Scotia Steel and Coal Co., Limited

Head Offices:
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MONTREAL

MODERN
GRINDING SERVICE

We've served many to their satisfaction and profit.

Conveniently located in manufacturing sections, we have grinding engineers who can give expert service. They are at your command instantly if not engaged on emergency duty.

Should troubles arise, if you have difficult problems to solve, if only you think your production might be speeded, or quality improved—

CALL ON US

If your difficulties are beyond our district and road engineers, we'll put the factory engineering staff at work to solve your problems.

Send us blue prints and specifications and we'll tell you what a Modern can do on your job.

Modern Plain Grinding Machines are built in 8 sizes—8″x18″ to 16″x60″, all full self-contained—ready for work when set.

Send for Technical Bulletin

MODERN TOOL CO., Erie, Pa.

Main Office and Works: STATE AND PEACH STS.

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RUDEL-BELNAP MACHINERY CO., LIMITED

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D.K.McLaren's

GENUINE BRITISH-OAK TANNED

LEATHER BELTING

TRADE MARK

The oak leaf is the sign to go by

Bear the oak leaf in mind the next time you are buying belting —it will guide you to better belt service.

A leather belt will transmit 25% more power than the same sized belt of other material.

D. K. McLaren's Leather Belting is just as good as we know how to make it. Only the **backs** of the choicest steers are used. They are skillfully, Genuine British Oak tanned by experts and all stretcher ends cut off before they are made up into belting.

That is why D. K. McLaren's Belting is **cheap!** Why it saves its users a remarkable amount of power, time and labor. Why it is as serviceable as a leather belt can possibly be.

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D·K·McLAREN LIMITED

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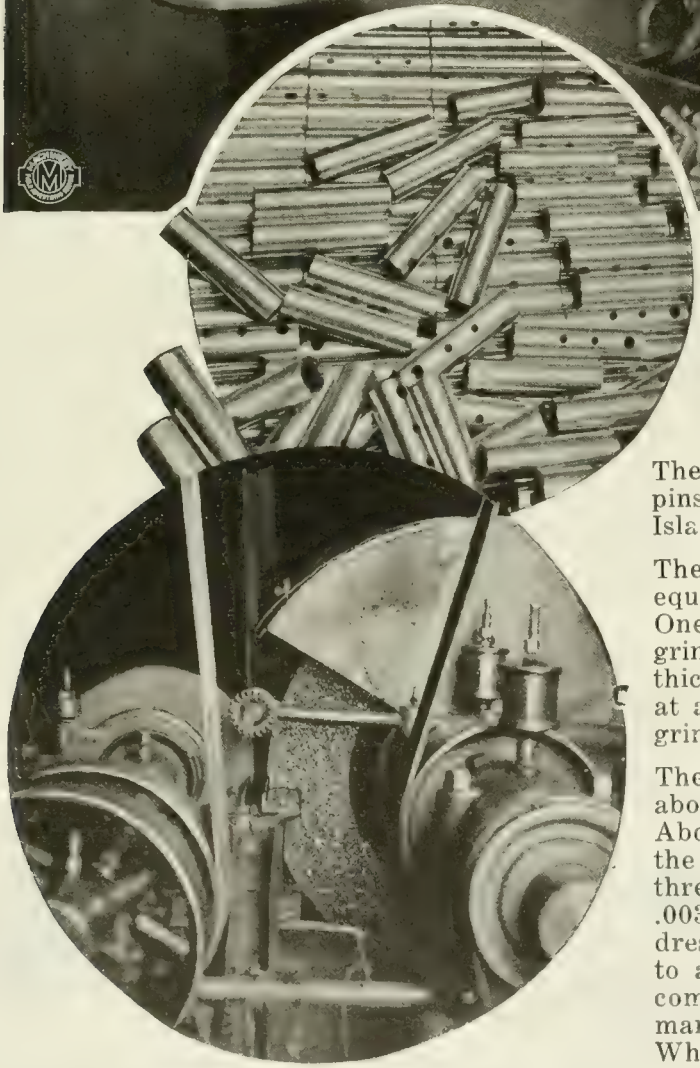


Satisfactory for both Roughing and Finishing on this Centerless Grinding Operation

The photographs show the grinding of steel wrist pins at the Houpert Machine Company, Long Island City, New York.

The machine is a Sanford Centerless Grinder equipped with two Waltham Grinding Wheels. One 120—2½ Alowalt, 20″ in diameter, 3″ thick, grinds the parts, the other of the same grade and thickness but only 10″ in diameter and working at a much lower speed feeds the pins to the grinding wheel.

The pins are .678″ in diameter by 2⅞″ long, with about .020″ left on the diameter for finishing. About .004″ of this surplus is removed each time the pin is passed between the wheels—about three or four times or until the diameter is within .003″ of the finished size. The wheels are then dressed and adjusted and the pins are finished to a limit of .0003″. Production averages 50 completely finished pins per hour—and the foreman gives much of the credit to Waltham Wheels.

If you have a unique or difficult grinding job try a Waltham Grinding Wheel. There's one for every class of work and the right one is bound to be satisfactory.

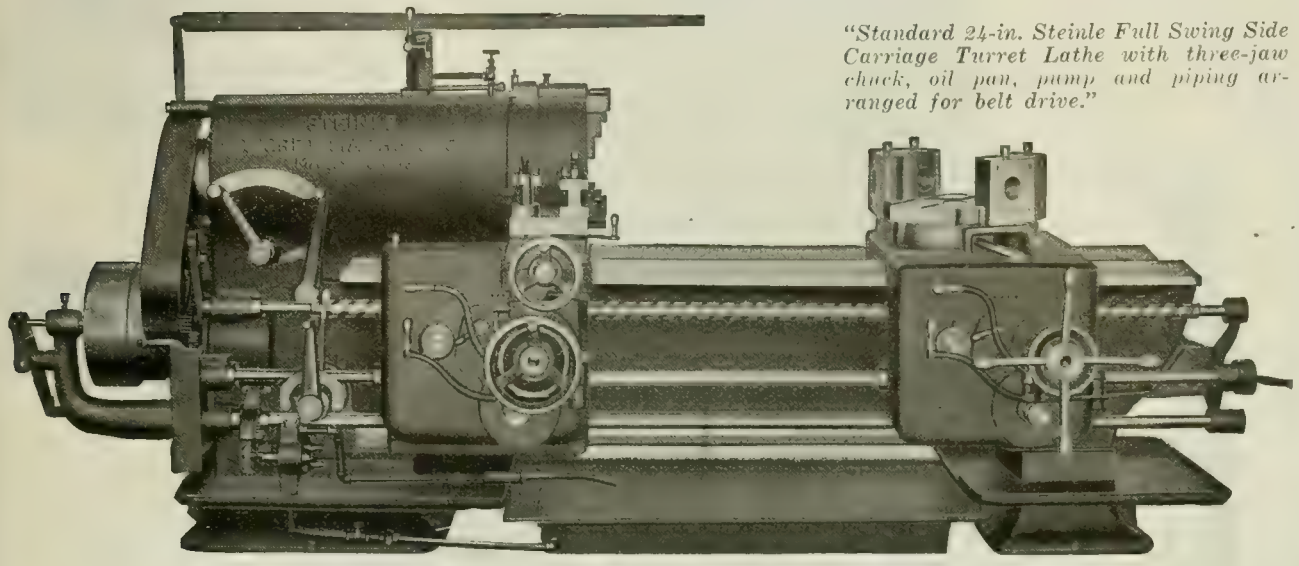
WALTHAM GRINDING WHEEL CO. OF CANADA LIMITED
BRANTFORD, ONTARIO

Eastern Canadian Agents: STANDARD MACHINERY & SUPPLIES, LTD.,
261 Notre Dame St., MONTREAL

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

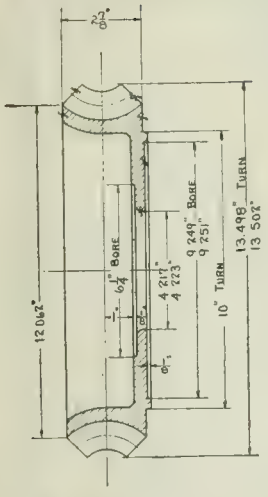
STEINLE

Full Swing Side Carriage Turret Lathes



"Standard 24-in. Steinle Full Swing Side Carriage Turret Lathe with three-jaw chuck, oil pan, pump and piping arranged for belt drive."

Chucking Problems for Steinle Solution



Material: Cast Iron
Time: 17 Minutes

In a large New England plant a battery of six Steinles is engaged in producing a wide range of parts, of which the one shown is a representative illustration of the rapid production obtained.

The gear is of cast iron and the operations completed include boring, counterboring, forming, shoulder, facing both sides of rim and forming gear diameter.

PERFORMANCE COUNTS, and that is why this manufacturer has just ordered two more Steinles.

"Send us drawings of your work so that our Engineering Department can estimate Steinle production, or ask to have a representative call upon you to determine what work can be produced to advantage on our machines."

Steinle Turret Machine Company

Originators of the Full Swing Side Carriage Turret Lathe

Madison, Wis., U.S.A.

AGENTS—Machine Tool Engineering Company, Singer Building, New York City; Cadillac Tool Company, Dodge Power Building, Detroit, Michigan; L. G. Henes, 75 Fremont Street, San Francisco, California, and Title Insurance Building, Los Angeles, California. FOREIGN—Leo C. Steinle, 53 Victoria Street, London, England.

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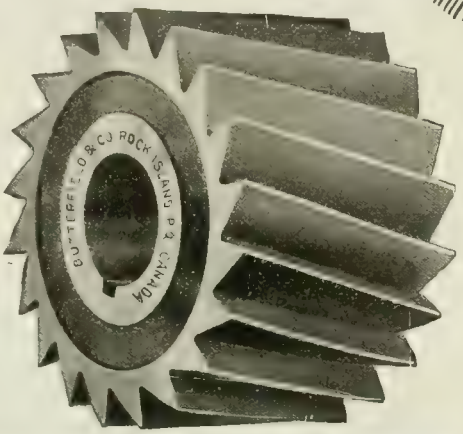
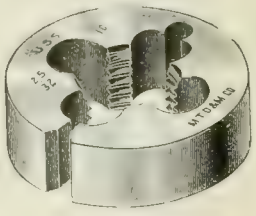
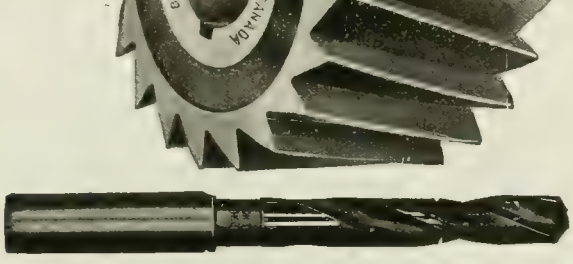
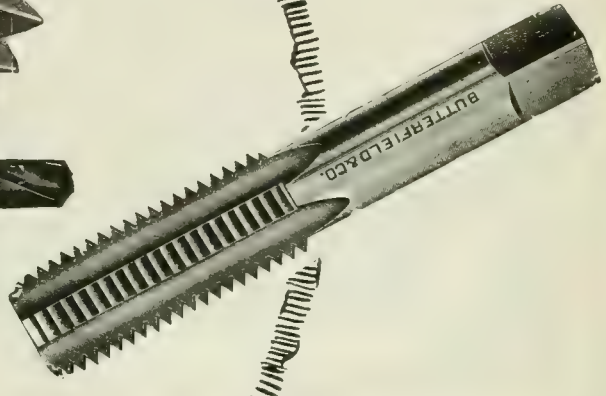
BUTTERFIELD

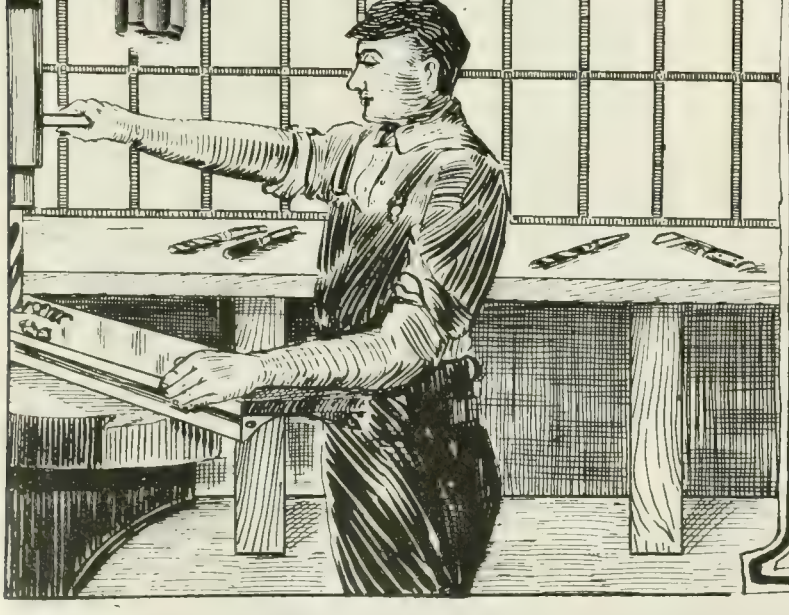








Taps and Dies
Milling Cutters
Drills and Reamers



THE workman who is supplied with Butterfield tools tackles his various jobs with confidence; he does his work deftly and quickly, and at the end of the day can show far greater production than if he used an indifferent line of tools. Butterfield Taps and Dies, Drills, Reamers, and Milling Cutters are noted for their strength and keen cutting qualities. **"They are the Tools You Buy Again."**

Butterfield & Co.
DIVISION
UNION TWIST DRILL CO.
Rock Island, Que., Canada

STORES—220 King Street West, Toronto. 131 St. Paul Street West, Montreal.

AGENTS—D. Phillip, 138 Portage Ave., Winnipeg, Man. The Triangle Co., Standard Bank Bldgs, Vancouver, B. C.

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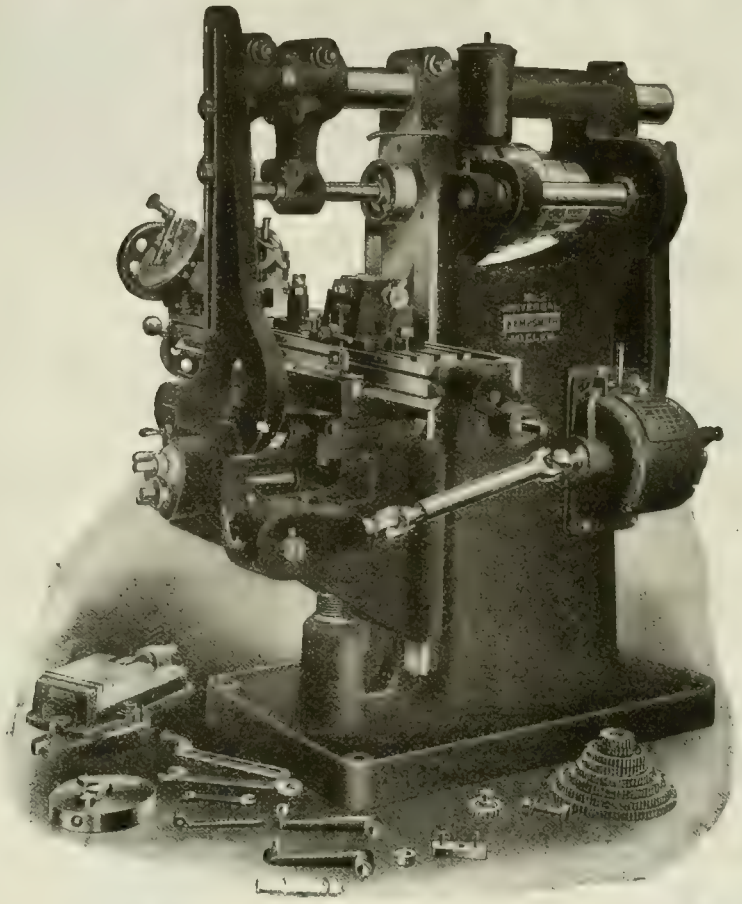
KEMPSMITH



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Thirty-two years ago the Kempsmith Company began its career in a small one-storey frame building. To-day there are four main buildings, aggregating 106,000 square feet of floor area, besides various storage sheds, etc. Every building of the plant is a model of its kind.

It has always been, and will continue to be, the purpose of the Kempsmith Company to produce machines of the highest quality only, suited to the most advanced practice.

Every machine, whatever size or type, is put to test under cuts and conditions purposely more severe than it will encounter in even the most progressive shops, and when it leaves our factory it has our positive and definite guarantee back of it.

Literature will be gladly sent upon request.

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CANADIAN DEALERS:—The Geo. F. Foss Machinery & Supply Co., Limited, 305 St. James St., Montreal, Canada; General Supply Co., 38 Toronto St., Toronto, Canada.

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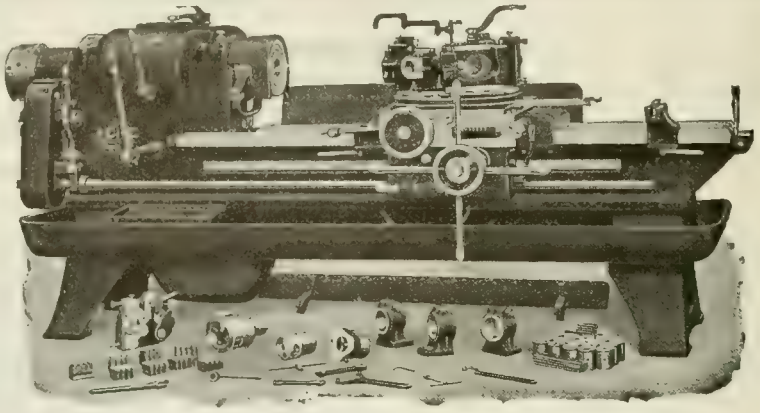
The Cincinnati Acme



A Flat Turret Lathe that Speeds Production

Right now in your shop the greatest demand of a lathe is for accurate speed. For speed means economical, efficient production. Cincinnati Acme Flat Turret Lathes are built for just this purpose and are designed for both bar and chuck work.

The head is cast solid with the body. The whole construction is remarkably rigid and compact, insuring at all times fast, reliable service. And only the gears doing the actual work run, a fact which means power bills cut to the minimum.

Write for Catalogue

giving full particulars on Cincinnati Acme Flat Turret Lathes, Screw Machines, Turret Lathes, Brass Working Machines, Universal Turret Lathes and all accessories. Every Cincinnati Acme Tool is designed on the most modern principles.

The ACME MACHINE TOOL COMPANY
CINCINNATI, OHIO, U.S.A.

Canadian Agents: Rudel-Belnap Machinery Co. of Toronto and Montreal

Heat Under Accurate Control

Here is an important factor in the heat treatment of metals. An intense heat, rapidly developed, and always under accurate control of the operator, is a feature that distinguishes

BELLEVUE FURNACES

These tool forges are particularly adapted for the requirements of the small machine shop for annealing and tempering dies, cutters, reamers, etc.

Combustion is perfect and no flames come in contact with material. Built to stand the highest temperature. Doors are properly counterbalanced. In every way BELLEVUE FURNACES meet with the demand for durability, efficiency and convenience.

Let us advise you about your heat-treating problems

Bellevue Industrial Furnace Company
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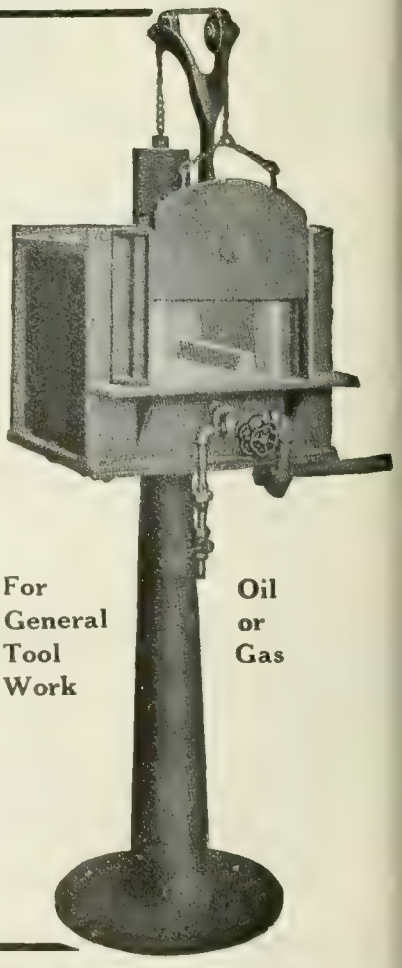
703 Bellevue Ave. - Detroit, Mich.

Representative in Canada: H. W. PETRIE, LIMITED, Toronto, Canada



For General Tool Work

Oil or Gas

TRADE MARK

"AW" DRILLS

Milled or Twisted

From the raw materials entering the steel to the finished drill a rigid inspection is given after each operation, which assures a superior product.

Prompt Deliveries on Special Sizes

High Speed Twist Drills

The Drills for MAXIMUM PRODUCTION

All Standard Sizes Carried In Stock.

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BRANCHES:
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More Speed Better Work With—

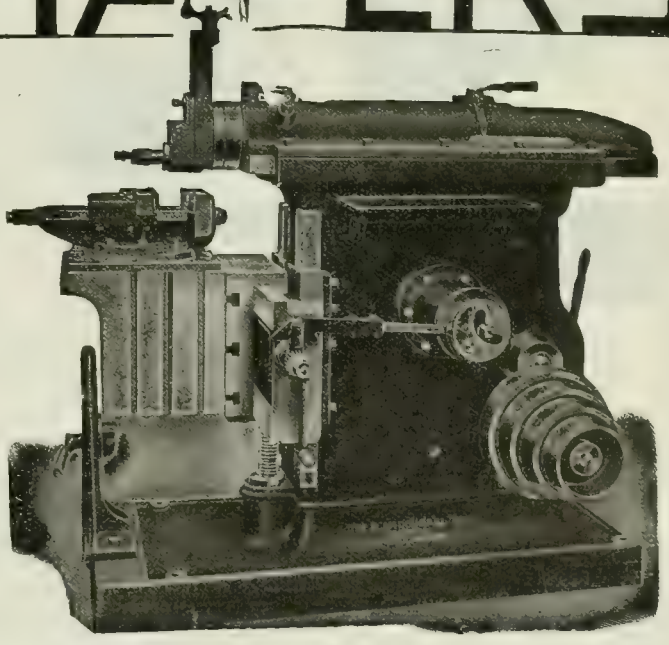
16 and 20 inch Crank

McDougall SHAPERS

Modern methods of manufacture require modern tools. McDougall 16 and 20-inch Shapers embody the best features of all machines which have been placed upon the market and can be depended upon to produce work **accurately** and **fast.**

An important feature is the column. It is massive in construction, well braced and reinforced internally. Has ample opening under ram for keyseating or other long work. Bearings for ram extend beyond vertical line of column both front and back. The ram is of exceptionally strong construction.

McDougall shapers have other points of interest you should know about. **Write for full description.**



The R. McDougall Co., Limited

Galt, Ontario

THE CANADIAN FAIRBANKS-MORSE CO., LIMITED
Sales Agents

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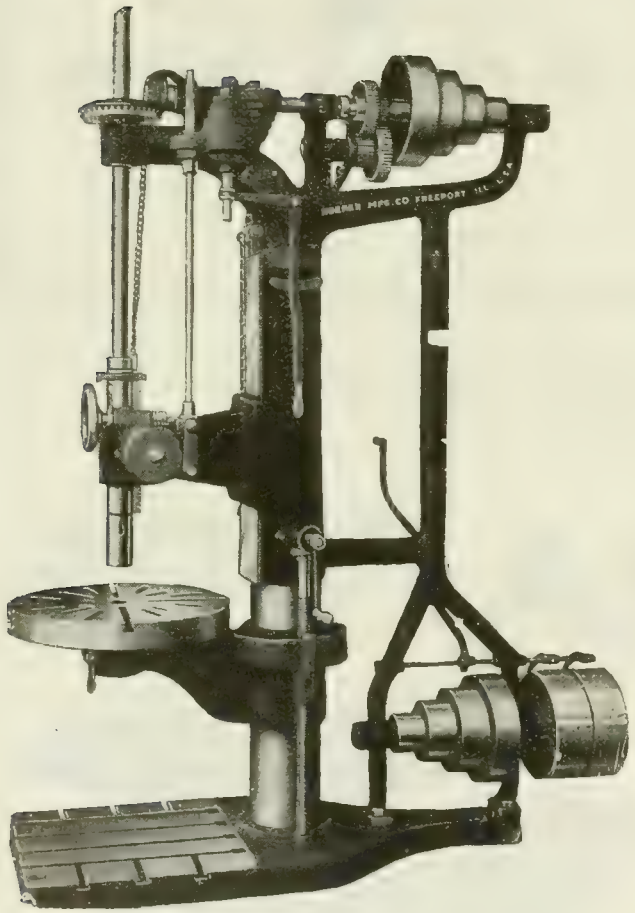
HOEFER

A driller service worth consulting



The value of any service depends on two things: the practical knowledge behind it and the spirit in which it is offered.

Hoefer Driller Service is worth consulting because of its helpfulness judged by **both** standards.

The practical knowledge behind Hoefer Service embodies a driller-manufacturing experience of over 25 years. But it includes more than that. Every Hoefer Salesman is first of all a shop man. He learned his subject in a shop, he used drillers long before he started to sell them, and he is capable of giving you suggestions of real value, based both on his own experience and that of the many up-to-date shops using Hoefer Drillers.

The spirit behind Hoefer Service is best indicated by its constant readiness at your call, irrespective of whether or not the sale of a Hoefer Driller is involved. A request for information or suggestions involves no obligation whatever on your part and is always promptly and courteously as well as competently attended to.

Try out Hoefer Service on your present or proposed drilling operations—it may point the way to unexpected possibilities for saving.

28

Send for the Hoefer Catalog.

HOEFER MFG. CO., FREEPORT, ILL.

Canadian Representatives: CANADIAN FAIRBANKS-MORSE CO., MONTREAL Branch Offices Throughout Canada

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Norton Alundum Grinding Wheels for Economy

When you are grinding on production work it is essential that you obtain the best wheel for each particular job.

The price of the wheel is only one element in the matter.

The factors that govern the costs on production work are:—

Pieces Ground or Weight of material removed	Per Hour
Pieces Ground or Weight of material removed	Per Wheel
Labor Cost	
Overhead Cost	

When these figures are obtained and compared you will find that you can use Norton Alundum grinding wheels to advantage.

You can expect the same results on wheels for general shop work even though such figures are not available.

We are ready to help you in any way possible, and if you will advise us the job you are doing—we will recommend both wheels and methods.

NORTON COMPANY OF CANADA, LIMITED

HAMILTON -- ONTARIO

Electric Furnace Plants:

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CANADIAN AGENTS:

The Canadian Fairbanks-Morse Co., Ltd., Montreal, Toronto, Ottawa, St. John, N.B., Winnipeg, Calgary, Saskatoon, Vancouver, Victoria. F. H. Andrews & Son, Quebec, Que. Simonds Canada Saw Co., Vancouver, B.C.

HYATT

Roller Bearing Hangers Increase Production

Instead of absorbing power in rubbing friction, as plain bearings do, Hyatt Roller Bearing Hangers transmit power to the machines where it can do useful work.

Shafting supported by Hyatt Roller Bearing Hangers turns so easily that at least 15% more power is sent to the machines, increasing production at least 15%.

With power costs steadily increasing it will pay you to install Hyatt Roller Bearing Hangers and turn more of your power into saleable products.

The Fairbanks-Morse catalogue contains valuable information regarding Hangers, Pillow Blocks and all shafting and transmission material. Consult the catalogue and write our nearest branch for any special information you may need.

If it isn't here write us

- Dick's Balata Belting
- Graton & Knight Leather Belting
- Belt Lacers
- Tools
- U.G. Hangers and Pillow Blocks
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The Canadian Fairbanks-Morse Co., Limited

Canada's Departmental House for Mechanical Goods

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Montreal				Victoria

CANADIAN MACHINERY
AND
MANUFACTURING NEWS

VOL. XXV. No. 14. April 7, 1921

Continuous Milling

Uses of Drum—Rotary and reciprocating types of continuous millers. Milling end, top, and bottom of automobile parts.

By J. H. Moore

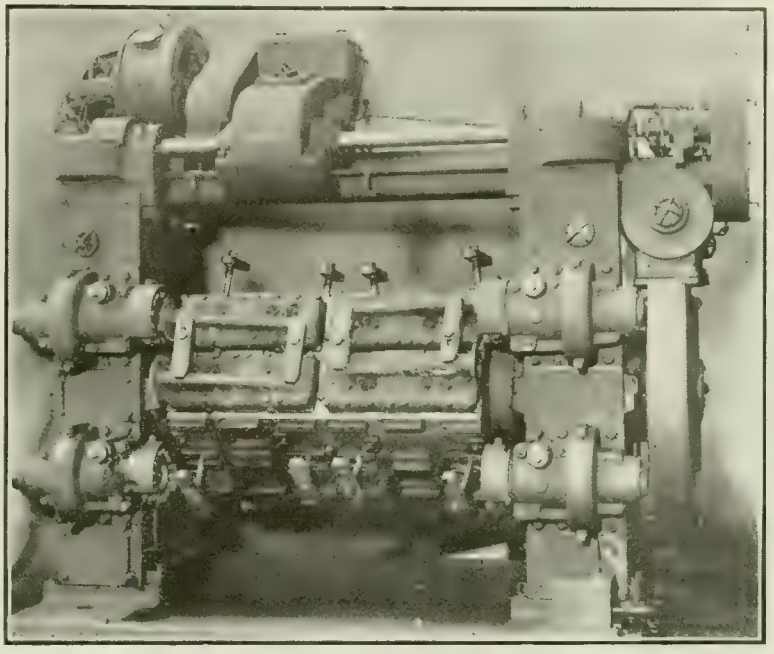
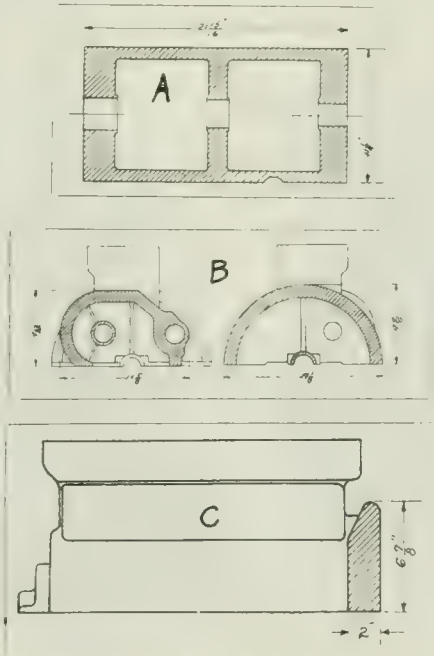


FIG 4—MILLING END OF CYLINDER HEAD FOR TRACTOR MOTOR

"A MACHINE that, while holding the work, operates upon it with a revolving cutter or mill may be termed a milling machine." These words are taken from a rather old text book simply to illustrate the fact that milling machines have developed wonderfully within the past few years, and while the above words still convey the principle of milling, they are rather weak in applying to the modern miller.

Walk through an up-to-date manufacturing plant today and what do we find? Batteries of milling machines, large, medium and small, each type of miller being especially adapted to certain classes of work, and where conditions permit continuous millers are used which practically eliminate the human element. All this has taken time. The first miller produced was very rough in character, yet had the correct principle behind it. Since that time improvement upon improvement has taken place, until at the present time we have work being performed on millers that was unthought of a few years ago.

The automotive industry has been largely responsible for this development, as their problem soon became one of quantity production, plus interchangeability. The various automobile concerns soon realized that if they were to be successful in producing cars at a minimum price, they must have ideal production facilities. This of course led machine tool designers away from the beaten path, special machines being the ultimate result. The value of a machine specially equipped to produce a standard product in quantity soon become apparent, and today it is a common occurrence to order a machine to produce some certain part. In other words, the machine is built around the piece, and specially adapted to the design of the part to be produced. True, this may only mean a standard machine with certain attachments or changes in design, but in many cases it means a brand new development.



EXAMPLES OF WORK PERFORMED.

Continuous Millers

One of the machine tools that has received a great deal of attention lately is that of millers, especially the continuous type. As the name implies such machines make possible the performing of duplicate operations without loss of time for loading or unloading of fixtures.

Through the courtesy of the Ingersoll Milling Machine Co., Rockford, Ill., we are able to illustrate in the present article certain types of continuous millers that have been produced by them for various purposes. With each photograph we will embody definite data regarding the machine and the product being manufactured, so that, in a way, the article will be a lesson on continuous milling practice.

It is of course easily understood that

milling machines of the continuous type do not always offer decided advantages over the more conventional styles used in the average plant. Each has its proper place, but there are unquestionably operations in large production plants where continuous milling can be adopted at considerable saving. However, let us leave this phase of the question for the present and consider one type of machine as used in continuous milling.

The Drum Type

Referring to Fig. 1, we see a drum type continuous milling machine that was built to mill the ends of a heavy duty tractor motor at the rate of 30 per hour. The large drum is mounted on a heavy axle and is driven from each side by huge worm wheels. It will be noted that the drum is six-sided, and that each side is fitted with a fixture to hold one casting.

The principle of such machines is briefly this: The drum, which in reality is the table, holds the castings and revolves past the spindle heads which are mounted on the housings at each side. In the machine shown at Fig. 1 there are two sets of heads, the upper heads carrying roughing cutters, and the lower ones finishing cutters. The operator stands at the rear of the machine, and as the drum revolves up past him, he removes the finished work and replaces the same with rough castings. The operation of the machine is continuous as the operator merely loads and unloads the fixture. The rate of feed is fixed, also the spacing of the fixtures, this determining the interval between cuts. In other words, maximum production has been carefully planned and the operator has no control over this factor.

It is easily understood that such a machine must be extremely heavy and rigid. The work is at a considerable distance from the axis of the drum and must be supported rigidly in order that an accurate, heavy cut can be taken. For this reason these machines are very rugged in design and the one illustrated at Fig. 1 weighs approximately 40,000 pounds.

By studying the photograph it will be seen that the heads may be adjusted vertically on the housings if so desired. Each head is also fitted with a special quill so that the cutter can be adjusted in or out as required. The drum itself is so arranged that it can be removed from the axle and replaced with another drum to accommodate different work, should such a change be necessary. As a general rule, however, this is seldom done, for, after all, such a machine as shown is a single purpose tool, and is not used except where there is enough work on some standard operation to warrant its installation. An outline drawing of the surface being milled is shown at A in Fig. 2, and a finished casting is produced every two minutes.

The drum travels at the rate of one revolution every twelve minutes, and it revolves continuously. In the case of the machine shown, the castings are brought to, and away from, the machine on a belt conveyor. The castings are machined within .002 inch of both square and parallel. The machine is 118 inches high overall, occupies a floor space of only 64 square feet and is driven by a motor mounted on a top plate, which is, of course, concealed in the photograph. The drum is mounted on an axle 13⅜ inches diameter, and is driven from each end by huge worm and worm wheels 29 inches in diameter. These figures show clearly the massive proportions of the machine.

Another example of the drum type is shown at Fig. 3. In this case the machine has a 42-inch worm wheel drive and was built to mill the top and bottom of a passenger car cylinder block at the rate of 240 every eight hours. The drum as before is six-sided, and in this particular machine the weight is 25,000 pounds.

One might go on indefinitely illustrating different applications of this type of miller, but let us merely show one more.

At Fig. 4 is shown a machine that was built to mill the end of cylinder heads on a farm tractor motor. The weight of the machine in this case is 27,000 pounds, and it is driven by a 42-inch worm wheel. It has a five-sided drum, the surface of which is designed to accommodate fixtures for twenty castings. As will be noted the castings are arranged in two rows, four on each side of the drum. The photograph was taken while the machine was idle, and shows only one side of the drum loaded. One hundred and forty castings are finished every hour on this machine. These machines can be built in almost any form, so that it is impossible to give in a short article of this kind more than a few installations.

Rotary Type

There are a number of continuous millers based on the principle of a revolving table turning beneath a column which contains fixed spindle heads, but the type shown at Fig. 5 is what is

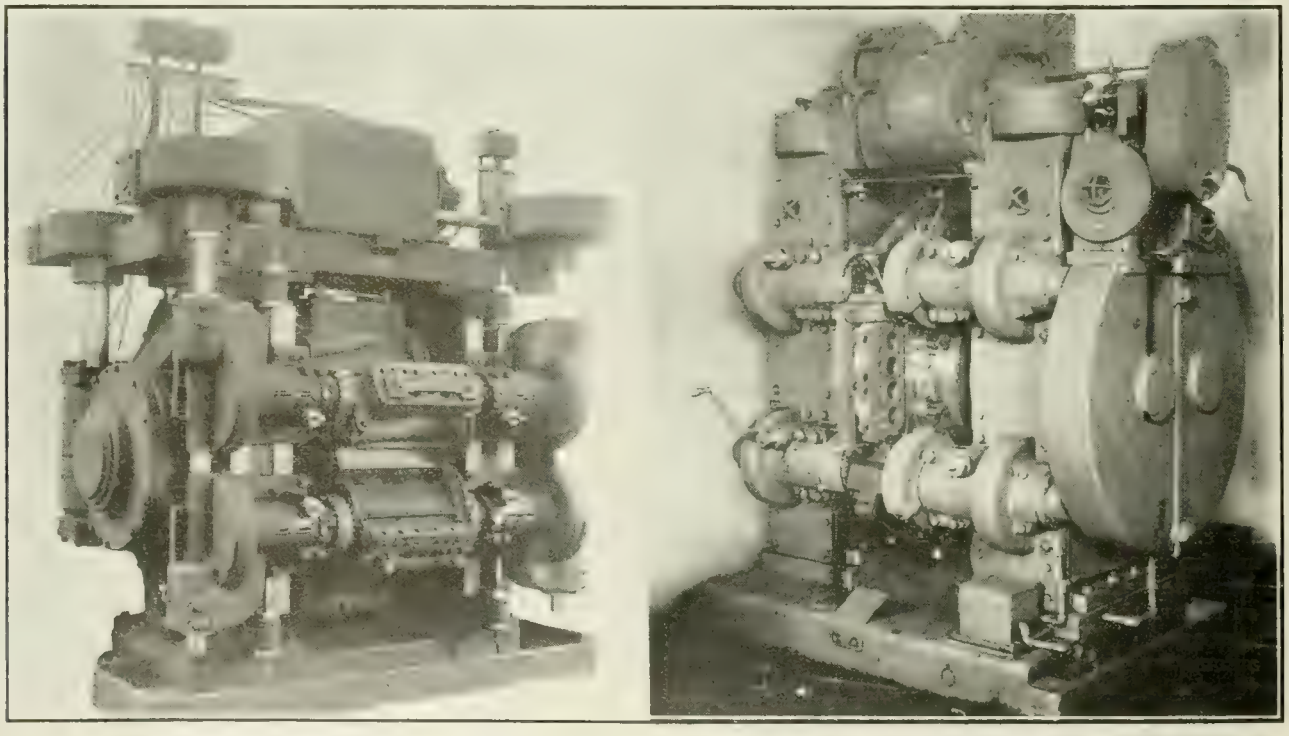


FIG. 1—DRUM TYPE MACHINE MILLING ENDS OF HEAVY DUTY TRACTOR MOTOR.

FIG. 3 ANOTHER DRUM TYPE MACHINE. OPERATION IS THE MILLING OF TOP AND BOTTOM OF PASSENGER CAR CYLINDER BLOCK

known as a rotary table miller. This style machine is built with one or more spindles, and Fig. 5 illustrates a single station, two spindle type machine. It will be noted that two cutters are used, one for roughing and one for finishing. The work being accomplished is the milling of the top and bottom of a cylinder head for a four-cylinder motor, and with the equipment shown 30 castings per hour are produced. The machine depicted weighs 10,000 pounds and occupies only 24 square feet of floor space. The fixtures used hold two castings in the first operation and two in the second.

The next illustration, Fig. 6, depicts what is known as a single station circular table machine. It will be noted that in this case the table revolves around a centre column, which also supports the head carrying the spindles. The machine illustrated was designed for milling the bottom of passenger car cylinder blocks, two cutters being used for roughing and one for finishing.

The roughing cutters are at the rear of machine and a portion of one of these can be seen in the photograph. Eight-inch cutters are used for roughing, and a 14-inch cutter, as shown in front of photograph, is used for finishing. The table of the machine is 60 inches diameter, and is fitted with five fixtures. The surface milled is shown in diagram form at B in Fig. 2.

This type of machine requires only a single operator. He merely unloads and reloads the fixtures as they revolve past him at the station beyond the finishing cutter. This machine is particularly useful where both roughing and finishing cuts have to be taken on pieces that are comparatively long, whereas a multiple station machine of the same type will give better results where the surfaces to be milled are shorter.

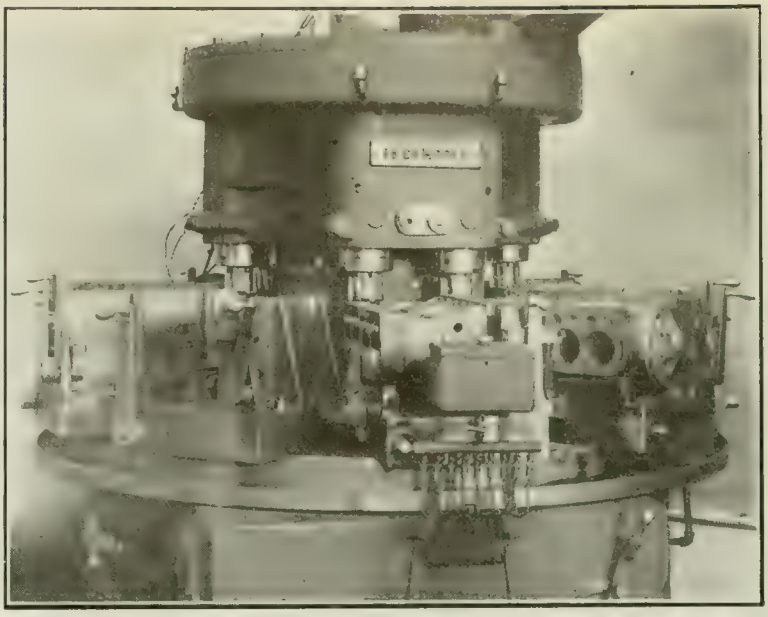


FIG. 7 THREE-STATION MACHINE DESIGNED FOR MILLING SMALL SURFACES ON THE SIDES OF CYLINDER BLOCKS.

Such a machine is shown at Fig. 7. Here we have a miller with six spindles, and three stations, yet requiring only 45 square feet of floor space. The work being done is the milling of a starter bracket pad on the side of an automobile cylinder casting. Both roughing and finishing cuts are taken, each station having a set of two spindles. Nine fixtures are fitted to the table and three men are required to unload and reload the work. Each man takes care of the output from his own particular set of spindles.

The amount of floor space saved by the use of such a machine is self-apparent and, as we know only too well, floor space in a manufacturing plant is a very necessary thing. Such a machine is well adapted to work of this nature, in fact to any work where a small pad at one side of a comparatively large casting has to be milled. Forty castings are produced every hour with this equipment, and the surface milled is clearly shown at C, Fig. 3.

Reciprocating Type

A rather interesting style of continuous miller is shown at Fig. 8, this being known as a two-spindle reciprocating type. This machine was designed for milling the pads on two surfaces of a transmission bell housing. Thirty castings are completed every hour, and the

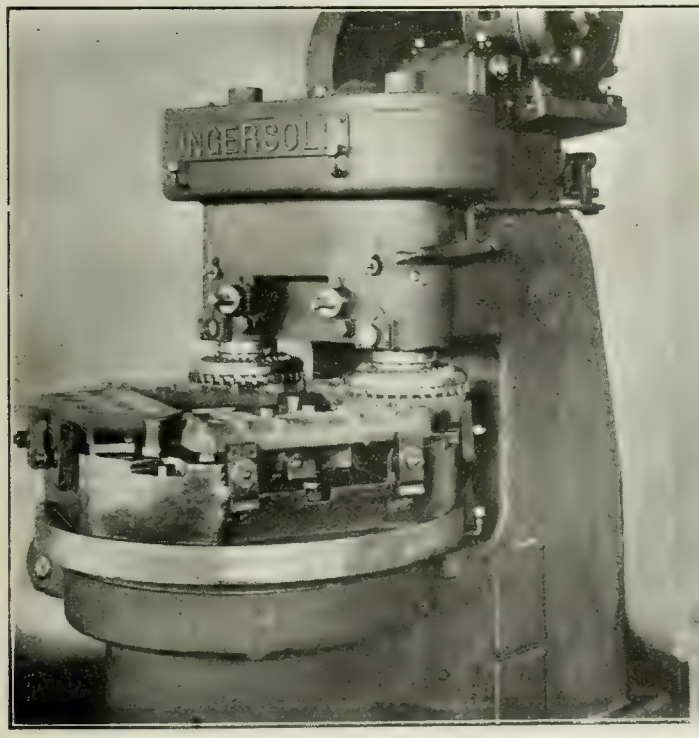


FIG. 5 A SINGLE STATION TWO-SPINDLE MACHINE MILLING TOP AND BOTTOM OF CYLINDER HEAD.

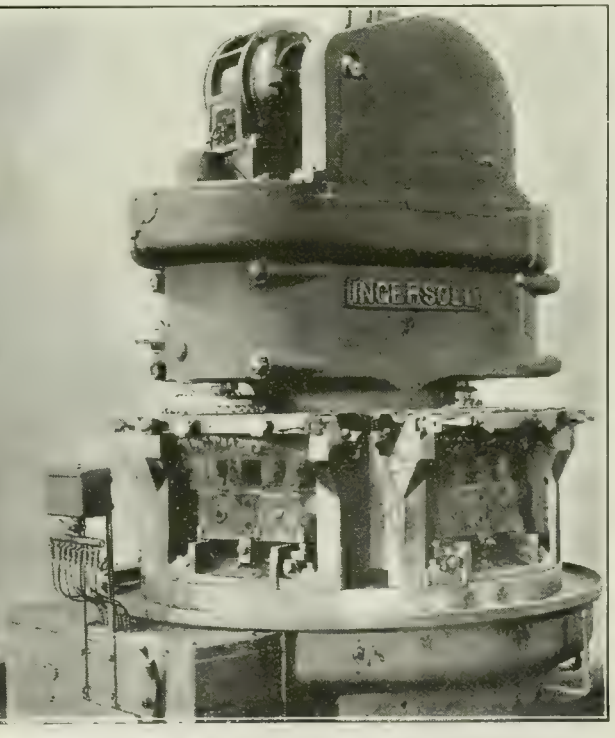


FIG. 6—A SINGLE STATION CIRCULAR TABLE MACHINE MILLING THE BOTTOM OF PASSENGER CAR CYLINDER BLOCKS.

machine itself weighs about 9,000 pounds, and occupies 36 square feet of floor space.

It will be noted that in this type of machine the continuous feature is not obtained through any revolving table or heads that carry the spindles. In this case the table is of conventional style, and is fed longitudinally and alternately in opposite directions. The table feeds, however, are automatic and continuous. Two fixtures are placed on the table, and while one casting is being milled the other fixture is unloaded and refilled with a rough casting.

The operation of this type of machine is very simple. After the first casting has been placed in the fixture, the table feed is thrown in. This takes the table forward at a high rate of speed until it approaches the cutter, when the speed is automatically reduced to the working speed, and continues to feed the work into the cutter at this rate until it has cleared the piece. When this cut is being completed the other fixture is being loaded.

The first piece being completed, the table feed is automatically reversed at a high rate of speed until the casting in the second fixture is brought up to the cutters. Again the feed is automatically reduced to working speed, and the same cycle repeated. The time of these changes is so arranged that the operator has ample time to load and unload his work, but should it be necessary to stop the machine for any reason, a throw-out lever is ready at hand.

Fixtures and Cutters

It will have been noticed throughout the description of these machines that merely a passing remark has been made regarding the fixtures and cutters used. This was done, not because of their unimportance, but through a desire to leave this subject to the last. It is easily understood that to make any machine efficient, the very best fixtures should be used. The operator can handle a well-designed fixture quickly, feeling sure at the same time that the piece is located properly. In other words, the operator requires confidence in his fixtures. The human element is practically eliminated, in as far as the machines themselves are concerned, so that in continuous milling, or in fact in any production work, it is equally important to make fixtures as foolproof as possible. This is said in all due respect to the operator, the idea being to help the workman, rather than cast any reflection on his ability. The concern whose machines we have illustrated tell us that they themselves lay no great claim to standardization of fixtures. As they put it, "We make each fixture to suit the work, as after all each is a special job in itself."

There are occasions in jig and fixture work where standardization of fixtures is a good thing, but in cases such as we have illustrated, and where the work is of a varied nature, each proposition requires different handling.

Of equal importance with the fixtures is the cutters. A cutter that will produce satisfactory results on one job will not always do on another. As a rule, however, a standard form of cutter will cover the majority of cases. The inserted tooth cutter is perhaps the best of any for work of the nature we have been describing, and Fig. 9 gives a good idea of the form of such cutters. As stated before, however, there are cases where it is wise to make special cutters to suit the nature of the work. After all, it is largely a matter of experience, and in a case where one is undecided they can readily call on the aid of the manufacturers themselves, who through experience are more familiar with such problems. There was a time when manufacturers were not so free with their advice and information, but this change is only another sign that we are waking up to the fact that it doesn't pay to build a stone wall around ourselves, for, if we do, we not only keep others out, but keep ouselves in as well. There is no reason why anyone should fail in a manufacturing problem to-day with the splendid advice at hand on all sides. This applies not only to continuous milling, but to all other manufacturing operations as well.

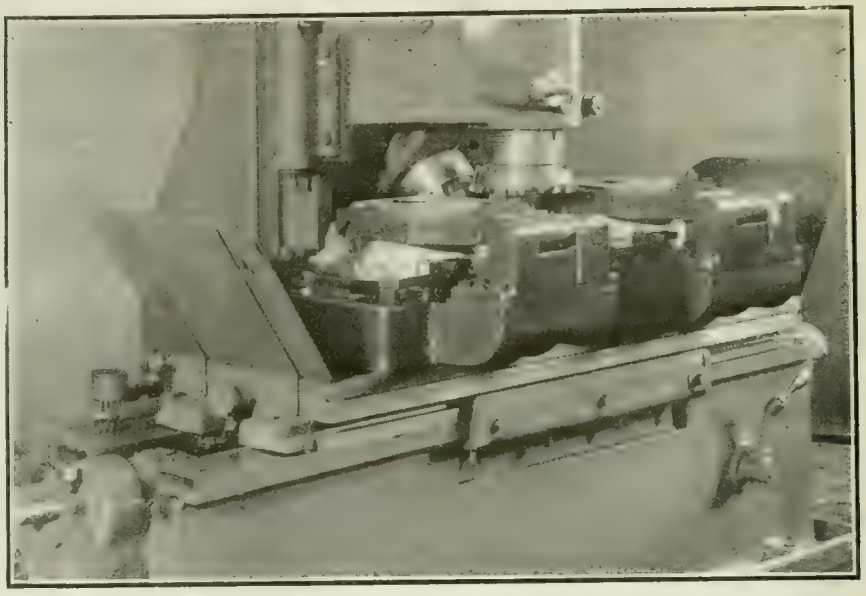


FIG. 8 TWO-SPINDLE RECIPROCATING TYPE OF MACHINE, USED FOR MILLING THE PADS ON TWO SURFACES OF A TRANSMISSION BELL HOUSING.

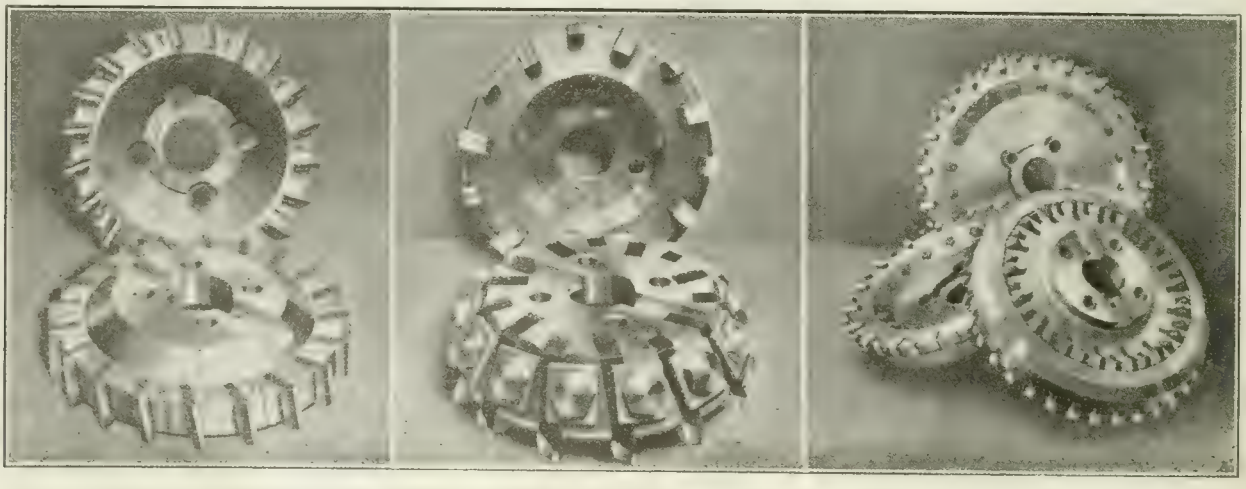


FIG. 9 SOME OF THE STANDARD INSERTED TOOTH CUTTERS. READING FROM THE LEFT THEY ARE KNOWN AS TYPE A, B AND Y.

Continuous Milling of Six-Throw Crankshafts

Milling of Shafts to Definite Length—Milling Both Ends of Six-throw Crank Shaft—Machining a Cast Iron Frame of Extremely Light Section—Milling Cylinder Block on Top and Base

IT is, of course, easily understood that we cannot attempt, in the space at our command, to treat the subject of continuous milling from every angle. In fact, we are lucky if we even hit the high spots. The subject could be talked about indefinitely, and still some new example of its use would be sure to crop up.

However, let us present some further examples of such work, and in this case we are indebted to the Newton Machine Tool Works, Inc., Philadelphia, Pa., for the illustrations shown. As we have already covered the main idea of continuous milling, viz., larger production, with a minimum of lost time, let us proceed to the illustrations.

Fig. 1 depicts the milling of 1⅜ inch diameter shafts to a certain length. These pieces are produced at the rate of 250 per hour, and the work is accomplished on a continuous type of machine specially adapted for facing work of varied nature. In this particular operation the intermittent feed and rapid traverse mechanism is used. That is to say, when the pocket containing the pieces has passed the cutters, the feed automatically trips and engages the rapid traverse, this advancing the work holding drums at a ratio of 10 to 1. Just before the next pocket containing the shafts comes into place, the rapid traverse is tripped, and the feed motion is re-engaged.

The loading of the drums is performed on the opposite side to that shown on the photograph, and the declampage, and unloading of the drum in this particular operation is automatically performed. It will be observed from the photograph that the clampage is obtained through a toggle lever. As the drum rotates, this lever is released by coming in contact with two studs that are bolted to the housing of machine. This allows the shaft to roll on to the pans, which have an inclined surface as shown. From here they go into a tote box, and in some cases on to a roller conveyor. In the application shown there are ten stations or pockets on the drum, each holding three shafts.

Fig. 2 depicts the same type of machine set up for milling both ends of a six throw crankshaft. It will be noted that the jig locates the shaft by the plungers in the center, and that they are placed alternately, this bringing them so close that the jump mechanism, as used on Fig. 1, is not necessary. The production on this work is 90 shafts per hour. The shaft overall is 33 31-32 inches in length, and the large flange end is 5 1-64 inches diameter.

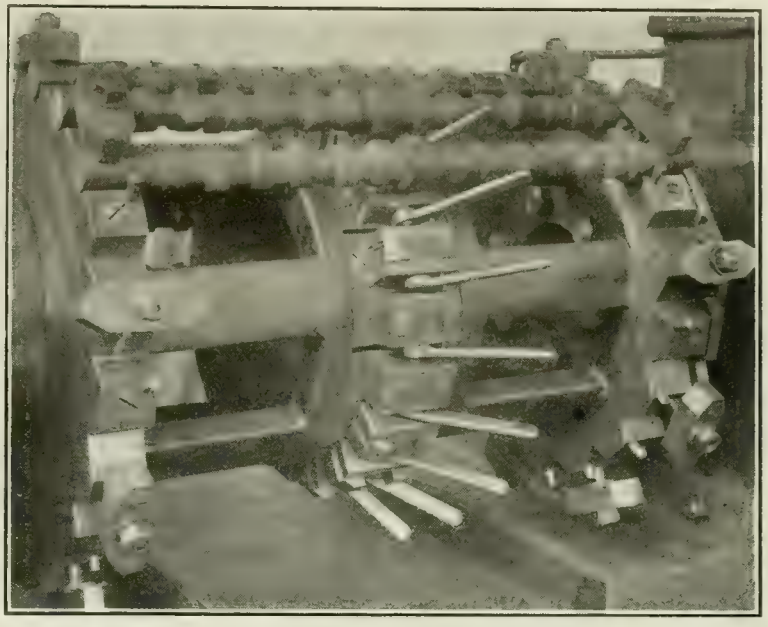


FIG 3—DOUBLE FACING CAM SHAFTS.

Another Example

At Fig. 3 is shown another double facing operation, the work in this case being a cam shaft. In this jig you will notice that the cam shaft is located by a universal chuck in the center, this working from the center bearing. The pieces are again placed so close together that the jump feed is not necessary. The production in this case is 180 per hour, the shaft being 1 5-16 inches diameter and 30 29-32 inches long.

The next operation, Fig. 4, is the machining of a cast iron frame of very light section. The piece is clearly shown on the photograph, and owing to its peculiar shape it requires rather elaborate jigging to ensure the piece being machined without distortion. It is ma-

FIG. 1 MILLING 1⅜" SHAFTS TO A DEFINITE LENGTH.

FIG. 2 THE SAME TYPE MACHINE MILLING BOTH ENDS OF A SIX THROW CRANKSHAFT.

chined on both ends, and is 4½ inches deep in section by 18 15-16 inches long. Forty-five pieces per hour are produced.

All these examples are produced on the same type machine, and briefly here are the chief points that will interest the designer especially. One head of the machine is mounted stationary at the end of the base, while the other head is adjustable so as to take care of work of varying lengths.

There is individual adjustment to each cutter spindle for setting the depth of cut, and for accurate work both roughing and finishing cuts are taken. The bearings of machine are oiled by a cascade system of lubrication, so that the machine does not require skilled help in its operation. The chief point is to learn the method of inserting the parts in the jig.

The cutter spindles are driven by worm and worm wheels, and the drum spindles are revolved by gears, both of which are driven by a common pinion, so that there is no possibility of their being out of register one with the other.

Drum Type

Next let us view an example of work on the drum type machine. This class of milling is especially adapted for machining surfaces, and can be utilized for machining one surface on two castings, or two surfaces on one casting at the same time. The photographs shown illustrate the milling of two surfaces on all castings, as, by so doing, one handling operation is avoided. In other words, if two castings are placed side by side, and only one operation performed on each, it will require double the amount of handling.

In Fig. 5 is shown a cylinder block being machined both on the top and base. Note that two small cutters are used for roughing, and one large cutter for finishing the surface of the block. It will also be observed that these cutters are not operating upon the same section simultaneously. By machining both operations at the same time absolute parallelism is obtained, whereas if these surfaces are machined separately a certain inaccuracy is almost certain, not to speak of the loss of time.

All spindles on this type machine have individual adjustment and are driven by worms and worm wheels, so arranged that the cutting speed of the finishing cutters is 80 per cent. of the cutting speed of the roughing cutters. Various speeds to the cutters are obtainable by pick-off change gears. The drum is rotated by herringbone gear through worm and worm wheel at predetermined rates which are also variable by the use of pick-off change gears. The drum spindle is of double taper bearing construction with very fine adjustment to prevent any end motion, the other bearing of the drum spindle being provided with a take-up bushing of the split taper type.

It will be observed that all gearing, splined shafts and revolving parts are fully enclosed and run in a bath of oil, pumped from the reservoirs on either side of the machine, to which, of course, the oil returns after having passed through the various bearings. All slow running bearings, such as the spindles, which are lubricated by pipe connections, have a special system of oiling in order that they do not become flooded. In the chucking of the piece, one clamp with a double bearing is used which simplifies the handling operation. Machining the top and the base of the cylinder block is accomplished at a production of 25 pieces per hour. This production has been very considerably exceeded in test operations, but the figures given are production figures only.

Various other photographs have come to the writer's attention on this particular class of machine, but enough has been shown to illustrate its possibilities. Here are a few production figures that we have gathered as average cases. Surfacing the ends of a cylinder block, 35 per hour. Machining both ends of a gear case, 40 per hour. One big feature (which has already been mentioned in the first article in the issue, but which is well worth repeating) is the saving of floor space by the use of such machines. It is claimed that in some cases as high as 80 per cent. of floor space has been saved, 40 per cent. of labor cost and 20 per cent. by machining both sides of pieces at one time.

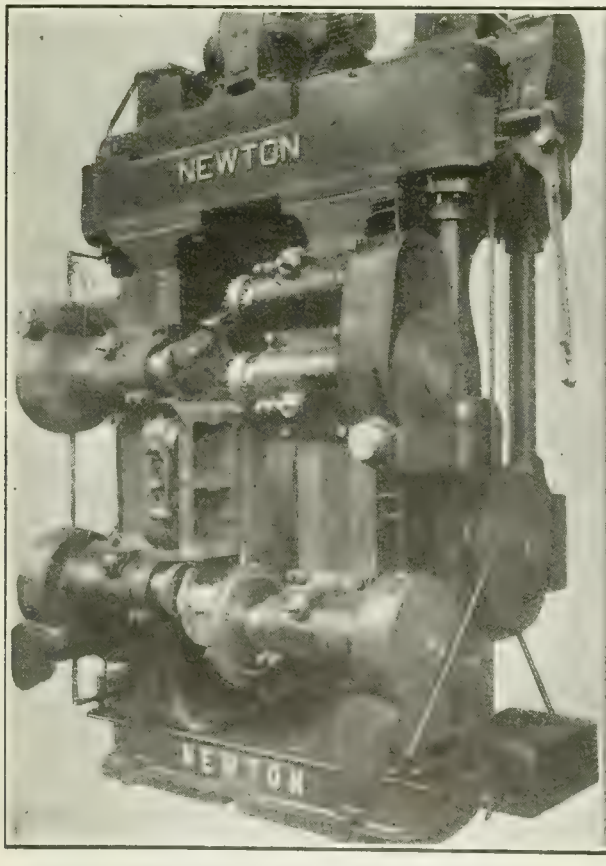


FIG. 5. MILLING TOP AND BASE OF CYLINDER BLOCKS ON DRUM TYPE MACHINE.

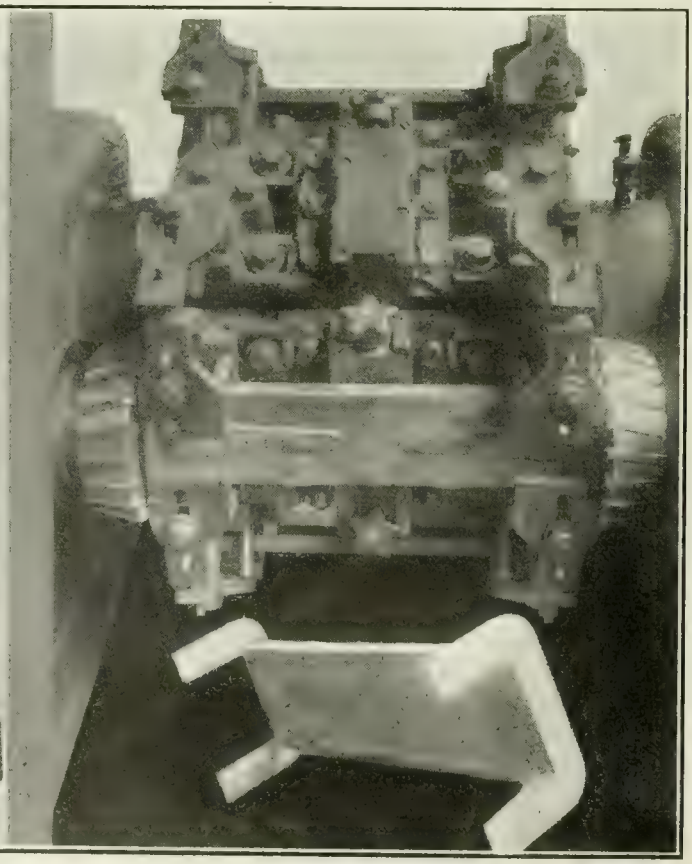


FIG. 4. MILLING A PECULIAR LIGHT SECTION PIECE WITHOUT DISTORTION.

Auxiliary Drill Heads As An Aid to Production

The Benefit of Having an Auxiliary Head for Some Special Job—Construction of Common Type of Drill Spindle—Sectional Views Showing Design of Drill Heads—Capacity of Drive Important

BY F. SCRIBER

AMONG production units are often found the so-called auxiliary drill heads, these being used as an aid to production. The word **auxiliary** is used presumably because these heads are attached to the spindle, or spindles, of drill presses and have a number of small drill spindles contained in them so that two or more holes may be drilled simultaneously. These heads are usually made specially to accommodate some particular job that is made in sufficient quantity to warrant the expense of making such a drill head. There are, of course, heads on the market that have adjustable spindles that will drill two or more holes at various center distances within the capacity of such auxiliary drill heads. The purpose of the present article is to explain how these heads may be attached to drilling machines, and a few examples of drill head construction are likewise shown.

By referring to Fig. 1 a clear idea of the general construction of a common type of drill spindle may be had. In this illustration A is the drill spindle, B is a ball bearing which takes the thrust of the drilling, this thrust in turn coming against the quill C in which the drill head spindle is revolvably mounted. At the top of this quill is placed a collar D. This holds the spindle in place, while a rack E is also attached to this quill for feeding purposes. Through the bracket of the drilling machine is placed a stud to which a gear F is mounted. Handle G revolves this shaft, thus turning gear F and moving quill C as required to do the drilling. Spindle A is caused to revolve by having a pulley mounted at end X, while at H is shown the tapered hole in the spindle with what might represent a drill shank inserted therein, all of which is common to one type of drill press, most drill presses being constructed either with single spindle along the same lines, or with a number of units that correspond.

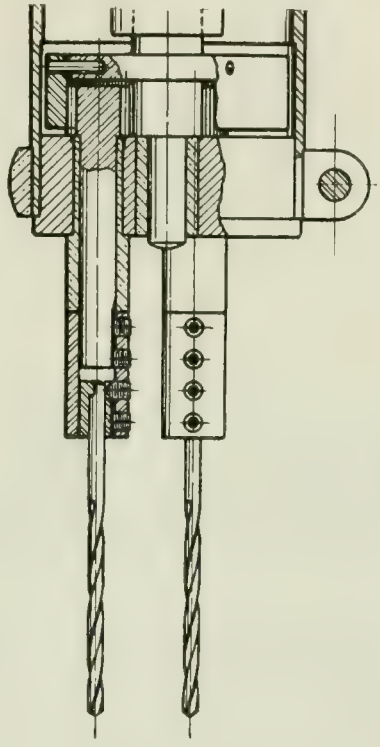


FIG. 4 THREE-SPINDLE FIXED CENTER DRILL HEAD.

Three Spindles

A three spindle drill press is shown in Fig. 2, in which this construction is embodied. This illustrates how belts A Fig. 2 drive the spindle and is used to amplify the description which follows.

In Fig. 3 is illustrated a modification of the quill and spindle shown in Fig. 1, where it will be noticed that the quill A Fig. 3 is made of hollow tubing with bushings B and C mounted therein. In these bushings are placed suitable bronze bushings D and H in which the drill spindles revolve and at F and G are shown the gear and operating lever together with the rack E, these being substantially the same as in Fig. 1. The particular feature to be noted in this construction is that the main driving

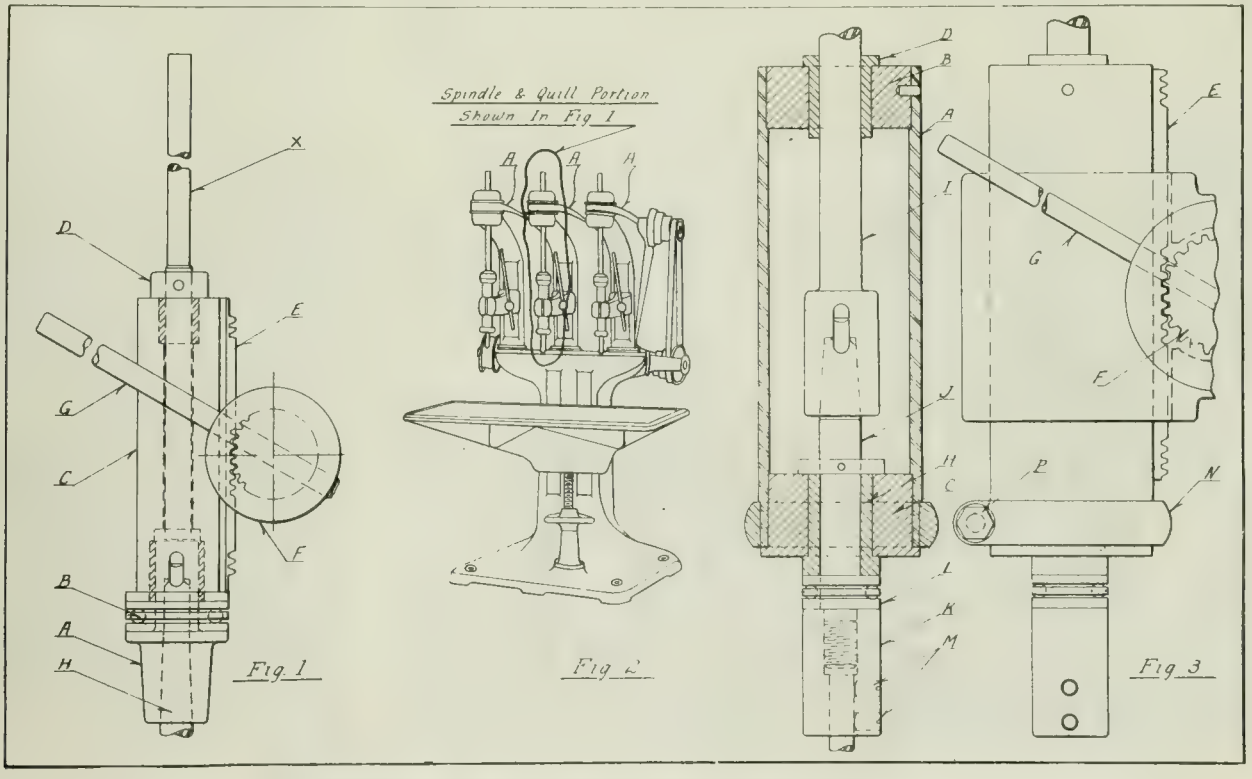


FIG. 1—GENERAL VIEW OF DRILL SPINDLE CONSTRUCTION.
FIG. 2—SHOWING HOW MULTIPLE DRILL HEADS ARE APPLIED.
FIG. 3—SINGLE SPINDLE WITH QUILL ARRANGEMENT.

spindle I ends inside of the hollow quill, and a small spindle J with a tapered shank on it is inserted in the end of the main spindle to which is mounted a drill holding sleeve K, this sleeve being threaded in place with the ball bearing L above it to take the thrust of drilling, while two screws M hold the drill in place. The lower end of the hollow quill has a slot cut in it, and a collar N is mounted on the lower end, this having a set screw P as shown. The object of this collar and screw is to clamp the bushing C securely in place.

In this construction one spindle only is shown, but should it be desired to put in two or three small drill spindles, the bushing C may be removed and a new bushing containing the desired number of small spindles inserted in its stead. These spindles will be geared together on the upper side of the bushing and when thus arranged would be driven by a center stud entering the drilling spindle I in substantially the same manner as is employed for driving the one shown. Fig. 4 gives a good idea of how this can be accomplished, although in this particular construction the spindle of the machine was not made as a hollow quill, but the two drill spindles were mounted in a sleeve. This sleeve was clamped to the regular quill on the machine, and moved up and down with the same in the usual manner.

To further amplify the last construction, and as a means of showing one type of adjustable drill head, let us refer to Figs. 5 and 6. Here are views showing a three spindle adjustable drill head in two extreme positions. Fig. 5 illustrates the drills set at their closest center distances, while Fig. 6 illustrates the same drills set to their greatest center distances. In this construction the drills A are mounted in chucks B, the ball bearing C taking the thrust of the drilling. The drill in the center at D is fixedly mounted to the body of the drill head E, while the two outer drills are mounted in carriers F and G in such a manner that they are allowed to pivot about a central point and when set to the required centers may be locked by screws H and I, it being obvious that if two holes only are to be drilled the center drill may be omitted from its chuck, thus leaving only the two outer drills to do the work. If the required centers are closer than what can be obtained by this method, one of the outside drills could be omitted. It is obvious that more than two carriers could be mounted in an auxiliary drill head body, in fact the number of spindles which could be carried is only limited to the driving power of the machine and its practical working capacity. This auxiliary drill head is clamped to the quill of the drill press and travels with the same in the regular manner as if the drill spindle was only making the hole.

Fig. 7 shows a bushing A which contains two drill spindles B and C. These spindles have gears mounted on the top, the gears being driven by an internal gear D. The internal gear is made with a shank on it at E. This entire arrangement is suitable for insertion in the hollow quills shown in Fig. 3, or Fig. 4, and can be used for drilling two or more holes, this depending of course on the capacity of the quill, although it is to be understood that holes drilled with this arrangement of gears would be equal distance from a common center, as there is no adjustment.

To complete the general description, Fig. 8 has been drawn with four drill spindles fixably mounted at different center distances, the four spindles being represented at A, and mounted in bushing B, with gears C, at the top to drive them. The drills are held in chucks D at the lower end of the spindles. Between these spindles are located two gears at E, which revolve on studs F, and a gear G drives these two intermediate gears, which in turn drive the drill spindles. This arrangement of spindles and gears is contained in a casing H, which is clamped on the outside of the drill press quill, while the tapered portion J on the center gear fits into the drill press spindle and is driven thereby.

If the gears in an arrangement of this type are not made to drive all of the spindles in the same direction it will be necessary to use drills having right or left hand spiral grooves depending on the direction of rotation. These drill heads are most advantageously used when made to work with jigs to do one definite class of work and are made with so called straight line drives, or with holes located in a circle or staggered, it being necessary to exercise considerable judgment in devising tools of this type to make sure that more drill spindles are not incorporated in the design than what the capacity of the machine will drive.

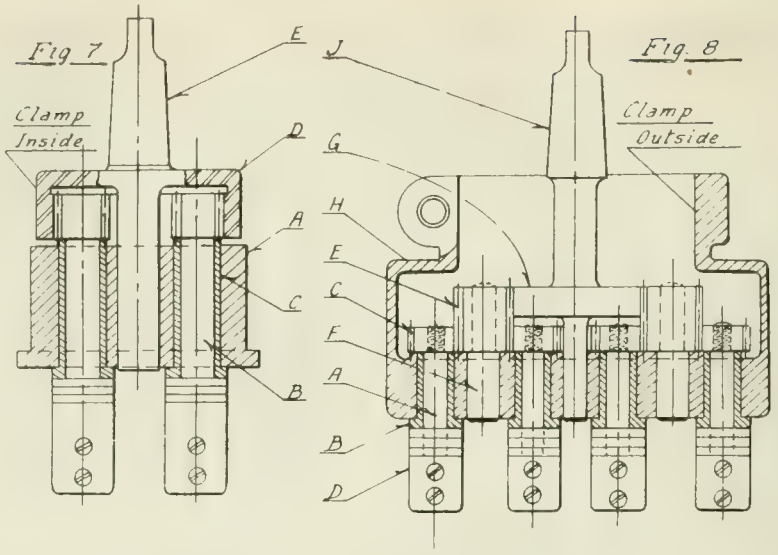
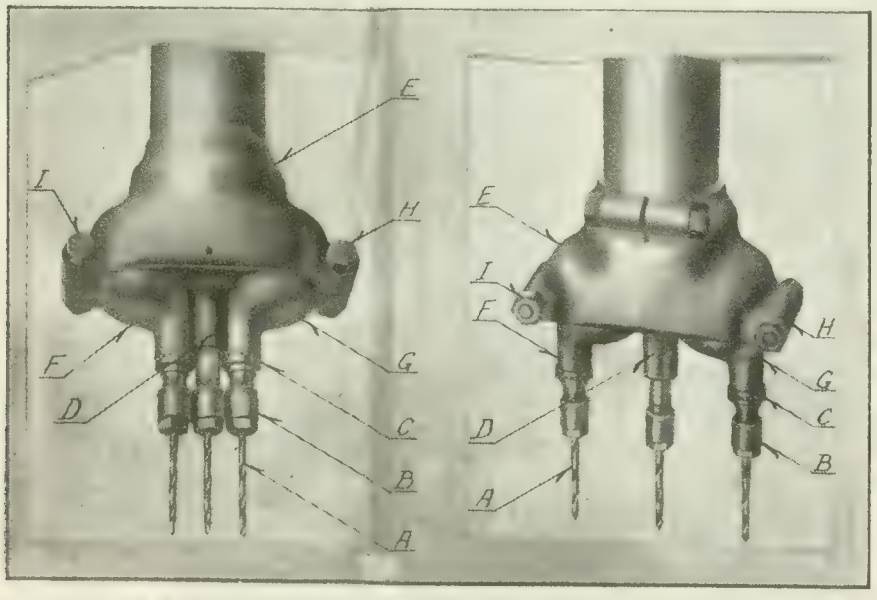


FIG. 7 TWO OR FOUR-SPINDLE INTERNAL DRIVE.
FIG. 8 FOUR OR MORE SPINDLE INTERNAL DRIVE.



FIGS. 5 AND 6 SHOWING THE TWO EXTREME POSITIONS OF A THREE-SPINDLE ADJUSTABLE DRILL HEAD.

Do You Tolerate Any Dead Time in Your Plant?

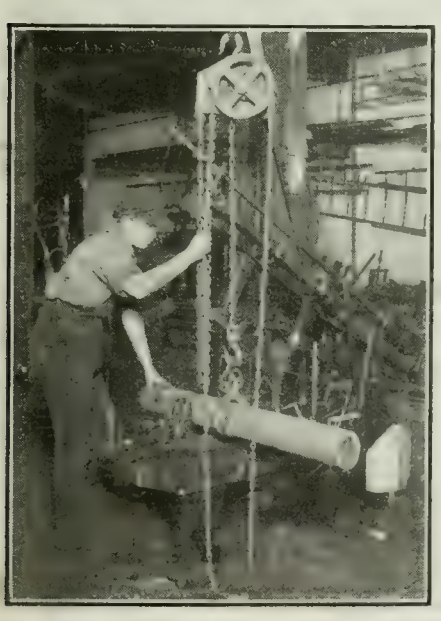
The Importance of Watching How Material is Handled—It Pays to Devote a Fair Share of Time and Thought To The Subject—Added Production at Lower Cost Will Follow

By M. R. MELDRUM *

CUTTING down the dead time is a matter of first importance to every owner of a machine shop, large or small. Consequently the superintendent or foreman who is alert and keen will be constantly on the watch for means to reduce the time spent on anything which is not actual production. It is strange, however, that so much time and energy is devoted to saving seconds on machining operations—time-studies, moving-picture studies, cost analyses, etc.—while a great source of lost time and lost motion remains almost untouched in the average plant.

Machine shops equipped with batteries of the most modern machine tools representing a capital investment of many thousands of dollars are regularly losing a large proportion of their carefully planned economics for lack of intensive study of material handling. What is the advantage of saving ten seconds on a milling operation when the workman has already wasted ten minutes in getting the job into the machine? Where is the saving effected by using a second head on a boring mill when a "helper" must be employed to assist in lifting fly-wheels or gear blanks on to or off the face plate? This article is intended to suggest to the progressive manager a few of the many places around a machine shop where a few hundred dollars invested can earn as much dividend as a much larger amount spent on the actual productive equipment.

*President, Herbert Morris Crane and Hoist Co., Ltd.



THE USE OF THE CHAIN BLOCK IS OFTEN FORGOTTEN WHEN IT COMES TO THE LOWLY HACKSAW.

Take the hack saw or cutting off machine. A piece of round bar is to be cut up for turning and key-seating. The bar weighs perhaps 500 pounds. Two men are told off by the foreman to get it from the stock rack and put it into the saw. It is heavy lifting, and, quite apart from the risk of serious accident, the men feel entitled to stand and chat for a few minutes after the bar has been set up, leveled, and the saw put in motion. Say five minutes each, ten minutes lost time in all. A length of I-beam hung from the roof, a trolley running on the lower flange, a chain-block suspended from the trolley, and one man can do the job unaided. The danger is eliminated, fatigue is avoided, and one opportunity for a chat has not been presented.

The Case of the Grinder

Now let us take a look at the grinder. How seldom does one see a quick-acting hoist placed where it will assist the operator to hold a heavy piece steadily at just the right height and with just the right amount of pressure on the wheel. And yet the grinding machine can absorb more time, produce more rejected parts and cause more nasty accidents than almost any other tool in a machine shop. Think of the emery wheels burst through misuse, think of the fingers and arms damaged by the man slipping with an awkward shaped piece. With a chain-block conveniently hung, the casting is balanced so that the operation can be correctly performed, the work checked and re-checked as metal is progressively removed and time is saved because the operator has confidence in his equipment.

The Lathe

A lathe is more commonly supplied with a chain-hoist than most of the other machine tools, perhaps because so many manufacturers realized during the war the time-economy on shell production resulting from the installation of proper handling devices. But the relative merits of a jib-crane, an overhead crane or a length of overhead track are not always sufficiently considered. The rig that is right for handling shells is not necessarily correct for wheels, shafts, armatures or flanges. The routing of the material, the form of the tote-box and many other factors should be allowed to influence the selection of the handling equipment.

The Planer

The planing machine is another tool which is often sadly neglected. Because it is a stately looking machine, with relatively slow, ponderous movements, is no reason why it should be allowed long seasons of rest between jobs. On the contrary, when the table is quickly unloaded and as quickly recharged, the percentage of saving is often a surprise as well as a delight to the manager. In the illustration shown, the planer in the background is fed by means of the overhead crane. No special construction was required. The crane runway was simply suspended from the roof and the crane runs on the bottom flanges of the beams. The bridge beam extends almost to the columns supporting the roof so that every inch of floor space is available.

Now let us take a look at the boring mill. This tool is fitted with a turret head holding cutter bars, reamers and turning tools, with a self-centering chuck, quick power traverse and a foot-brake, all to hasten production. The addition of a speedy little electric hoist, conveniently swung from a jib-crane, makes the installation complete and prevents the time gained in machining from being frittered away in handling. But the hoist must be compact, for most shops have insufficient head room for a long, cumbersome hoist. It must have

RELIEVE THE STRAIN AT THE GRINDING WHEEL IN THIS MANNER.

a large factor of safety, because very few machinists can accurately gage the weight of a casting without doing some figuring. It must have such safety devices as a self-centering controller and a limit switch designed to cut off the current when the hoisting hook threatens to run into the overhead gears. The lubricating system should be very simple so that the machine operator can fill up the reservoirs at the same time and with the same lubricant as he employs on his machine tool.

In nearly all of the foregoing applications of mechanical hoisting equipment, an almost indispensable adjunct is a trolley with a short piece of track. The trolley should be very free-moving so as to be quickly responsive to the will of the operator. For this reason roller bearings are a necessity rather than a luxury. For good results, both as to ease of running and long life with low maintenance cost, the rollers should be large in diameter, completely enclosed and perfectly lubricated. It is a mistake to suppose that a bundle of steel wires can possibly constitute a roller bearing in the sense that they will eliminate friction.

The best form of track or runway is undoubtedly an I-beam, though two channels, back to back, will serve almost as well, provided that the bolts or rivets connecting them do not project so far as to interfere with the use of a standard trolley.

Sometimes a roof beam or the tension member of a roof truss may be utilized to advantage. But care should be taken to check up the strength of the structure before applying a load which was probably not included in the architect's calculations. It is also poor economy to use an existing structural member unless it happens to come just in the right place to serve the machine efficiently .

Occasionally a flat-bar track offers advantages in lower first cost as compared with the I-beam. This occurs mainly when the roof or ceiling is supported on wooden joists at 16-inch centres. The hangers can then be closely spaced and the light track well supported at short intervals. Otherwise it may be necessary to provide a wooden supporting beam over the full length of the rail, and the economy of first cost immediately disappears.

The question of suspension by means of suitable hangers is worth a little study to ensure that the building will not be damaged and that the track will be properly supported so as to provide a strong, stiff, straight and level path for the trolley. Standard hangers are obtainable and they offer the advantage of facilitating erection by avoiding the need for drilling holes either in the track or in the structure.

Standard twelve-foot lengths of track, complete with hangers, end-stops, trolleys and lifting gears offer a very easy solution to many a handling problem for the busy executive. The only equipment still required is a suitable sling or bale, and even these accessories have been developed to a highly practical extent on thoroughly standardized lines. A well-designed grab or sling is like a giant hand to aid the workman: it takes hold instantly, grips the piece firmly and releases promptly; a good sling completes the equipment of labor-saving machinery.

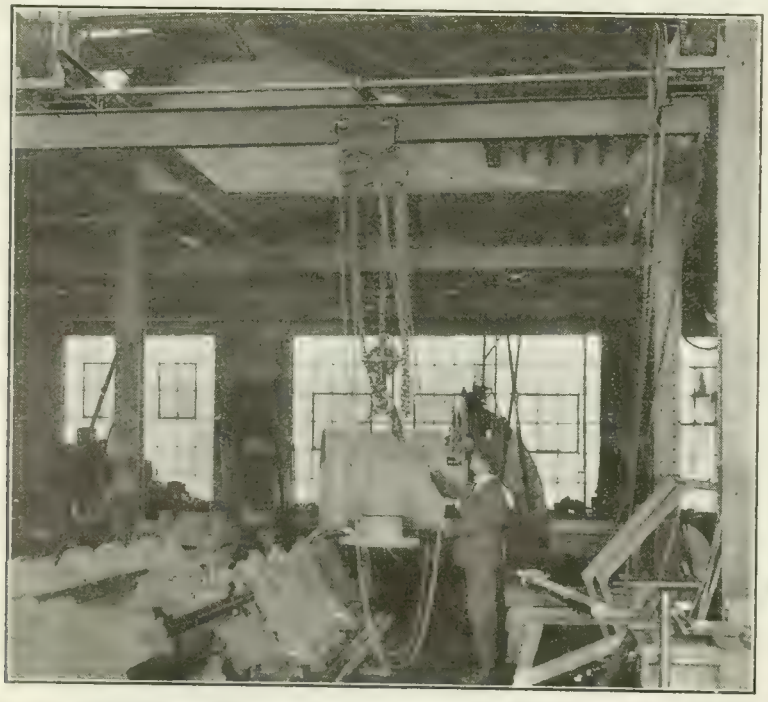
Many superintendents are allotting to this subject a fair share of their time and thought, and we think that enough has been said to show that it is an important function of shop management. Adequate handling facilities will not in themselves make money for the owner, but they will at least permit him to keep the money he makes in the use of his productive plant.

DANGER TO BE AVOIDED

Greasy floors in machine shops are always a possible source of danger, and should, as far as possible, be prevented. In any case really dry sawdust should be used to absorb as much as possible of oil and grease, and sharp sand should also be applied from time to time to give a foothold, but this material should not be used in excess. Sawdust from non-resinous wood should be used for absorbent purposes where obtainable, as the grease passes into the fibre in such cases.

HINTS OF VALUE

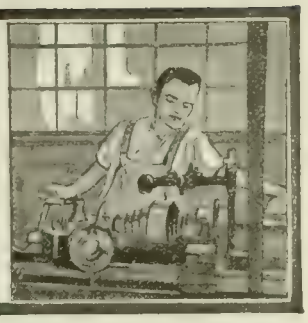
Shortly after a fire in a certain plant in England the following hints were given: Don't store oily cotton waste in a warm place at all, and don't store it where firing will cause danger anywhere. Under favorable conditions oily waste, as well as some other things, will oxidize rapidly, and in the presence of air will ignite through the heat engendered; and this should be thoroughly knocked into the heads of people handling the stuff in workshops, as it is quite easy to have a fire from some "unknown cause," or of which the "origin unknown" report is given by the fire brigade. Of course, as a waste product, greasy waste has some small value, but it is better to burn the stuff right away than to have a fire during a busy time. These hints, in a way, seem unnecessary, yet, strange to state, we still forget these simple precautions.



ON THE ERECTION FLOOR A CRANE IS PRACTICALLY INDISPENSABLE.

AN ARRANGEMENT AS SHOWN CANNOT HELP BUT AID PRODUCTION ON THE LATHE.

WHAT OUR READERS THINK AND DO



What is Your Opinion Regarding This Job?

A Case Where the Salesman of a Firm Differed With the Superintendent of a Plant in Regard to Production of Cross Head Pins—Give Us Your Views on Making Pump Rods

By J. H. RODGERS.

THE superintendent of a certain railroad shop in Montreal was called upon some time ago by the representative of a well-known turret lathe manufacturer, and during the interview the question of cross head pins came to the fore. When it was learned that the company was taking an hour to produce one of these pins, from the bar, the salesman showed his surprise and intimated to the superintendent that it was possible to turn these out at the rate of one every twenty minutes; as a matter of fact, the machine had been advertised to do this. The superintendent was more than interested and sent for the machine shop foreman, who, when he came in, was made acquainted with the salesman of the —— company. This particular foreman was not a native of Missouri, but nevertheless was the kind that had to be shown. This the salesman seemed willing to do, and the twain adjourned to the shop and to the turret lathe used in machining the pins.

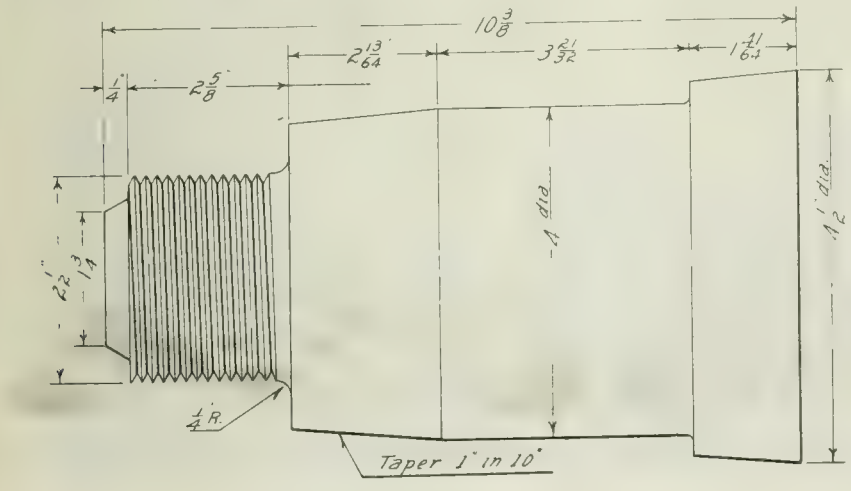
The salesman recognized the machine as one of their own, but of a design several years old. However, he was convinced, in his own mind, that too long a time was being taken in making these pins. Looking over the equipment he stated that it would be necessary to make a few slight changes before starting on the work. As it was then late in the day the representative said he would be in the first thing in the morning to commence work. The foreman asked him how long it would take him to do the first pin, and the reply was reluctantly given as "about an hour," and 20 minutes for those following. The foreman noted this on his pad.

Nine o'clock the following morning the salesman appeared. The machine operator had been busy for two hours cleaning up and getting things ready for him to start. The machine had been stripped and thoroughly cleaned, the bar ready, with the necessary tools and equipment neatly arranged on the floor in front of the machine. When the "20-minute man" saw the layout he turned on the foreman with the remark:

"You were making these pins last night. Why did you strip the machine?"

"The machine is generally this way when we commence a job," replied the foreman. "You will remember I asked you how long it would take you to do the 'first' one."

The foreman was not desirous of taking any mean advantage of the salesman, but he realized the position he might be placed in should the representative's efforts coincide with his statement of "20-minute pins."



DETAIL OF THE CROSS-HEAD PIN.

The salesman was given full scope to show what he could do, and his labors were finally rewarded. Four hours passed before he delivered the first pin —and it might be here stated that this one would not pass inspection. Before the day closed he succeeded in finishing a few others, and the best time for one pin was about 68 minutes. However, he apparently showed little disappointment and took refuge behind the statement that "he would send a man from the factory who would do them in 20 minutes." Several weeks later a man made his appearance at the shops.

"Are you Mr. Foreman?"

"Yes, sir."

"I'm from the ——— company."

"Here in connection with the cross head pins?"

"Yes. Could I see the machine?"

This fellow was a regular "dummy," and when he was taken out to the machine, he had nothing to say, just moved from one position to another, watching every move of the operator, saying never a word. This continued for several hours. At last he seemed satisfied, and turning to the foreman, who had just come up, he remarked:

"You have a 90 per cent. man there." (It might be mentioned that the operator had been tipped off and that he was doing his utmost.)

"Can you make the pins in 20 minutes?" asked the foreman.

"I think not, but I could cut your time considerably."

"Show me," said the foreman.

"I'll start in the morning," was the parting remark of the conservative talker.

This fellow must have retired early that night as he made his appearance shortly after seven the following morning. Without any waste of time or

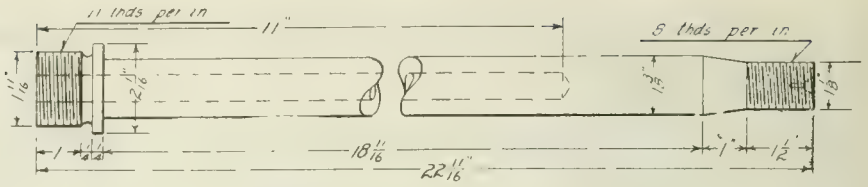
words he started in, and to see that chap work would have put an old-time slave to shame, and have made Lincoln sit up in astonishment—if he were alive. The man seemed to be everywhere at once, and, after the machine was set up, he performed his work systematically, using his entire body in manipulating the various wheels and levers; arms, legs, hips, and probably his head, all apparently going at the same time. He came out of the mixup and succeeded in making a pin in 48 minutes. He told the foreman that he could do still better, but that he did not want to show up the workman.

"Never mind the operator," said the foreman, "show us the best you can do—the very best."

This he consented to do on the understanding that no mean advantage would be taken of the workman. "Go ahead," replied the foreman, "the time has been set at one hour, and it will remain at that, no matter what you may do."

Again the physical distortions started and with even more strenuous efforts—but the "best one" took him 68 minutes. He had a little trouble with his tools breaking. The average time the demonstrator made ranged from 48 to 60 minutes. The shop time remained at one pin per hour.

That the readers may have some idea of the pin in question a detailed sketch is given herewith. Opinion of readers on the production of these pins (or similar work) in quantity, from bar stock, would be appreciated, and would doubtless be very interesting to those working on such problems. The time under discussion is that required to completely turn the pin and cut the thread, ready for insertion in the cross head, with the exception of the drilling of the pin hole and the cutting of the keyway. Complete turning time, not just roughing.



HOW WOULD YOU MAKE THIS PUMP ROD?

Another Piece

A query has come in from one of our readers as to what time it should take to make pump rods similar to that shown in the sketch. These are made from cold rolled stock, and the dimensions given are finished sizes. It is required to know the time taken to finish this piece from the bar, in readiness for insertion in the pumps. The time must be that taken for all roughing and finishing operations. Give details of tooling.

Editor's note.—We particularly desire readers to answer these queries, for by so doing they will be rendering a real service. We shall pay for all accepted material at regular space rates.

STORAGE OF DRAWINGS

Whenever the subject of drawing storage is brought up, discussion is sure to follow. In discussing the subject Practical Engineer comments as follows:

So far as is possible all drawings should be made to some suitable scale which is uniform throughout the whole of the work done, and fixed sizes of paper should be used for the general sizes of drawings made, although occasionally a larger or smaller sheet may be required, and also it may be necessary to use a larger scale occasionally for the sake of greater clearness in the workshop. Many drawings are not of permanent interest and, sepaking generally, are not worth saving, but some things have to be kept and referred to for years. In such cases drawers should be provided slightly larger than the standard sizes of paper used, and in these drawers the drawings should be stored flat, the creasing or rolling of any drawing of a permanent character not being at all desirable.

Even cloth tracings are best kept flat, although they suffer less from rolling than does paper. Tracings on tracing papers should be always kept flat and uncreased, while the new paper should never be creased or folded, as the ink will spread and run in a disconcerting manner. Beyond this most tracing papers must be kept air-tight or they lose their transparency and become useless for practical purposes.

NEAR PRIZE WINNERS

Here are the other ten readers who came so near to landing a scale: O. F. Anderson, Hartford, Conn.; Wm. Smith, New Liskeard, Ont.; W. K. Mulock, Winnipeg, Man.; P. J. Ryan, John Morrow Co., Montreal; William M. Plummer, Bolton, Ont.; B. Back, Hamilton, Ont.; Chas. E. Mars, Brantford, Ont.; E. W. Todd. Penetanguishene, Ont.; George Land, Peterboro, Ont.; Harry Browrigg, Stellarton, N.S.

Letters patent have been issued this week changing the name of the National Steel Car Co., Ltd., to that of Hamilton Car Co., Ltd.

Milling Machine Extension

During these times, when work is none too plentiful, it makes one think a little before turning any jobs away from the shop. The writer received an order for quite a number of bevel gears which were so large that the table of the milling machine would not drop low enough to allow the wheel blank to pass by the cutter, after being tilted to the angle required by the dividing head. We decided to raise the spindle of the milling machine after the same manner often adopted on the lathe. The sketch, Fig. 1, shows the layout of the machine rigged up for the job. This fixture is composed of two castings, A and B, an enlarged view of one of these being shown at Fig. 2. The front casting, A, is bored and faced to suit the spindle C, the spindle being bored to take the taper arbor of the miller. The two gears D and E are used to drive the spindle, the gear E is threaded to suit the spindle proper, the gear D being keyed to the top spindle C; the overhanging arm is the one belonging to the machine. The change is easily made by taking off the caps of the bearings and inserting the two extensions and bolting in position. The machine is driven in the usual manner. This advice has given entire satisfaction and will be used for large spur gears in future.

By G. Barret

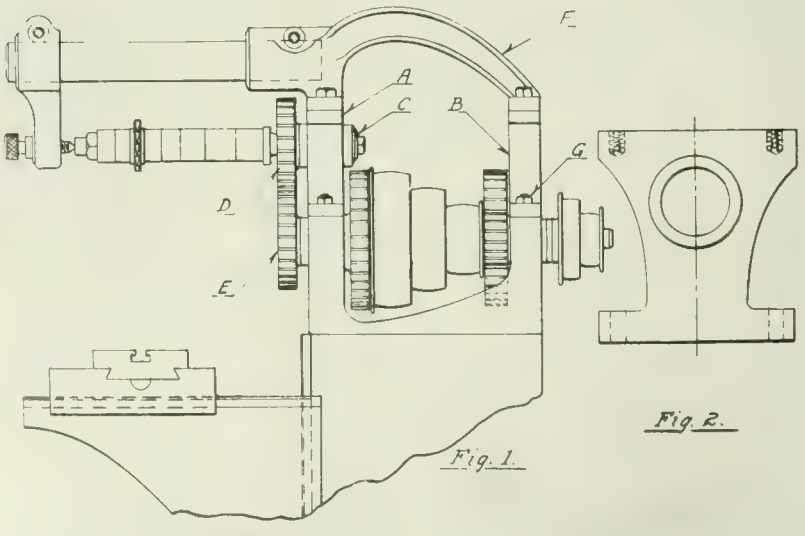


Fig. 1.

Fig. 2.

Canadian Machinery

WATCH FOR THESE PANELS. FILE THEM AWAY, FOR THEY ARE SURE TO COME IN HANDY.

DEVELOPMENTS IN SHOP EQUIPMENT

DRILL AND REAMER HOLDER

The Woodall-Basch Tool Co., Syracuse, N.Y., have placed on the market a drill and reamer holder as shown in the illustrations. These merely depict two of its uses. Briefly here are its characteristics.

The holder consists of a centre sleeve with a large head through which a T-slot is milled at right angles to its centre line.

This sleeve can be fitted to any taper or left straight as the need may be. It has a taper reamed hole to receive a centre that takes the place of the regular centre of the machine where the holder may be used.

Fitted to float freely in its T-slot is a head for holding drills or reamers, which consists of a malleable iron casting in the form of a collar connected at one end to a bar which is at right angles to the collar. This bar is the part that floats in the T-slot in the sleeve. In one side of the collar end of this head a "V" is formed and lined with hardened steel plate against which the tools are held by means of a headless screw. A hardened and ground steel centre is fitted to the taper of the sleeve and projects through an opening in the bar into the opening back of the collar. This centre takes the place of the regular centre and locates the tools on centre line.

The use of this holder is not confined to any one class of lathe, for practically all styles, even including turret and screw machines can make use of the device. It can also be used on drill presses with good success.

ROTARY PISTON PUMPS

The St. Louis Pump & Equipment Co., St. Louis, Mo., have placed on the market four different styles of their duplex rotary piston pumps.

Briefly, the pump consists of twelve principal parts, these being the pump case with dividing partition, two end plates, a steel shaft with two eccentrics mounted thereon, two pistons, two rocker arms and two checks.

Two chambers or cylinders with shaft passing through centre of each—two eccentrics, directly opposite in throw or 180 degrees apart, mounted on the shaft. Surrounding these eccentrics are the two pump pistons. These pistons are pivoted to the rocker arm, which serves to produce the reciprocating movement of the piston through the action of the eccentrics.

In this way a composite reciprocating and rotary motion of the pump piston, without actual contact of piston and cylinder walls, is obtained. The clearance, however, is so small that a liquid seal results, and so positive is its action that after long service it is said to pull better than 29 inches of vacuum.

The piston check is the only moving part touching the cylinder wall, and this functions only at the point of transition at the end of the pumping suction movement or stroke to the beginning of a new stroke. The wear on this check is taken up automatically. While the piston is discharging, it is acquiring fresh liquid on the opposite or suction side, and the piston in the opposite chamber is functioning conversely, thus giving balanced action and continuous flow.

The head at one end of pump case is blind—that is, the shaft does not extend through. This eliminates packing. At the other end, a gland which holds the packing material is bolted to the head. This gland is separate from the bearing bushing. The gland is designed to act simply as a gland, and the bearing bushing to serve solely as a bearing.

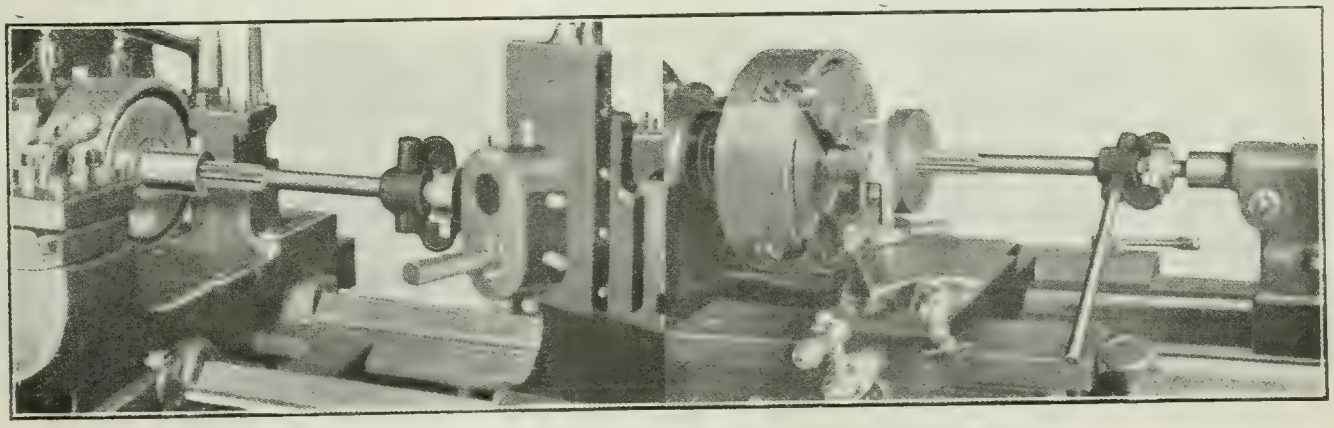
The pump is very compact, light in weight and is said to be practically free from vibration. It is also self-lubricating.

Various accessories and variations from standard equipment can be attached, these including pressure gauge, air chamber, by-pass and relief valve, foot valve, strainer, flanged pipe connections, electric remote control, etc. One style will pump lubrictaing oils from the lightest to the heaviest, in fact the pump is said to be able to pump any liquid of a non-volatile nature that can be handled in metal. The other types are, of course, for varied purposes, but as stated before we have not the space to enter into detail.

ELECTRIC SOLDERING IRON

The use of the electric soldering iron to manufacturers in general is too self-evident to require any comment, and a new type of such an iron has been offered to the trade by the Vimy Supply Co., 567 College St., Toronto, Ont.

This iron has been approved by the H.E.P.C. and Canadian Machinery has had an opportunity of handling one. It is very compact, has a push button control in the handle, and the copper bits are readily removed and new or larger bits inserted if required. This is accomplished by means of a suitable socket. The iron heats up very quickly, and the control button in handle regulates the heat. One button is painted red. By pushing this in the circuit is made through the element. With every iron is given a guarantee for one year, also a few hints to iron users in general that are well worth following out.



TWO EXAMPLES OF THE DRILL AND REAMER HOLDER IN USE

WELDING AND CUTTING

An Efficient Method of Welding Pressure Vessels

The Aim is to Secure Better Rating on the Welding Of Such Vessels—Preparing the Work—Testing the Strength of the Tank—Pressure From 500 to 1,800 Pounds Applied

By ANDREW OLIVER.

ONE of the most important projects of the American Welding Society is that of securing a better rating on the welding of pressure vessels by the Boiler Code Committee of the A. S. M. E. In the Standard Oil Company plant at Whiting, Indiana, we have experimented with autogenous welding of all sorts of pressure vessels. Some of the most important work that we have done is shown in the photographs.

Figure 1 shows one of our tanks before welding. This is one of the first methods of preparing the work that we used. To the left of the tank is seen one of the ends all ready to be inserted. This flanged head was prepared in a manner similar to the standard boiler makers' practice. Then it was inverted and welded.

Figure 2 shows the result of this weld. Note that the head is perfectly flat. The principal problem was to find a means of testing the strength of the tank. We had only one set of pumps with pressure enough to make a reasonable test. The tank was filled with hot oil and pressure was applied to 500 pounds. The tank was then tested by hammering and showed no defect. The pressure was then increased to 1,000 pounds and a slight bulge was noticed. When the pressure was again increased to 1,500 pounds the tank bulged quite a bit more, but did not break. Further attempts at increasing the pressure resulted in stalling our hydraulic pump at 1,800 pounds without any noticeable effect on the tank. Before releasing the pressure this tank was tested by stout blows with heavy sledge hammers, and no leaks developed.

Another tank somewhat similar to this one is made of 15-inch extra heavy steel pipe, tested to 1,000 pounds per square inch and put in service under working pressure of 300 pounds. In service the heat has burned holes in these tanks, but no heads have blown out.

Our experience in pressure welding is not limited to these tanks. We keep ten or twelve locomotives in repair all the time and do a great deal of tube welding and we have had no failures of any consequence during the past six years. In the construction of stills we are now starting to increase the application of welding every week. Our former practice was to use a double row of rivets on these stills. In the future we plan to make a lap joint, insert a single row of rivets and then double weld them. At this point these questions were asked:

"In beveling these longitudinal seams, do you make a double 'V'?"

"No. We make a double bevel: that is, one side only is beveled to an angle of 45 degrees on each side of the seam."

"What is the reason for welding on the inside?"

"The weld on the inside is simply a wash weld to make the joints smooth."

"Do you make the entire outside weld first, then come back and weld it again on the inside?"

"Yes."

Since this first experiment many different types of pressure vessels have been welded in our shops. Figure 4 is diagram of one that we make in great numbers. This tank has to stand a working pressure of 100 pounds to the square inch and is constantly subjected to a temperature of 750 degrees Fahr. The tank is 44 inches long and 20 inches in diameter and is made of one-half inch plate throughout. The diagram shows clearly the difference in construction of the head. This difference in construction lowers the cost of material and of preparation, and this head stands as much pressure as the flanged head shown in the other illustrations. The heads are dished with a hammer and beveled with a torch. The side seam is beveled to a 45 degree angle with the torch before welding. When the oxy-acetylene process is used, the seam is welded both outside and inside. The head is inserted about half an inch below the head of the cylinder. This gives the welder a better chance to get at the work in such a way as to make sure of thorough penetration. The method of operation is to weld three or four inches lightly, fill to the top, and so on, to the end of the seam or weld.

After welding, these tanks are subjected to a pressure of 600 pounds per square inch with cold water and tested with a sledge. The first one of these

FROM LEFT TO RIGHT—FIGS. 1, 2, AND 3.—THESE VIEWS SHOW PREPARATION, COMPLETION, AND TESTING OF THE TANK.

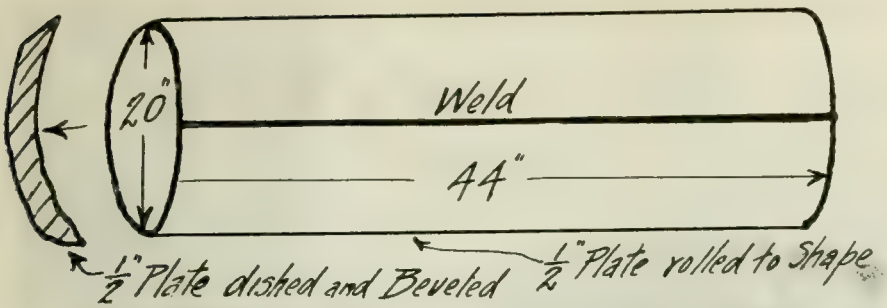


FIG. 4—DIAGRAMATIC VIEW OF A TANK PRODUCED IN QUANTITIES.

to be constructed in this manner has been in daily use for four years, subjected to both heat and pressure, and is still giving good service.

Further Questions.

Following this, several other questions were asked, and for convenience we will head the paragraphs Q. and A., these, of course, representing the questions and answers.

Q. Doesn't this, in the case of the oxy-acetylene weld, have a tendency to set up a strain?

A. This has never been noticed.

Q. How do you allow for the expansion and contraction?

A. When the welding is started, an opening of ⅝ inch for every foot of length of stem is left at the far end.

Q. How do you keep the crack open?

A. With a wedge.

Q. Will this spreading change the dimensions of the tank?

A. No; the weld contracts and closes the sheet to proper dimensions.

Q. Isn't it true that the greatest contraction occurs when the welder is working at the centre of the seam?

A. Yes.

A. Does the process (gas or electric) used make any difference in the amount of opening?

A. Yes, there is more radiation in gas welding, so, when using the electric arc process, not quite so much opening is required.

Q. Which process is used in making the tanks just described?

A. Both.

Q. How much reinforcement is made on the seam weld?

A. Just a trifle over the surface. The added metal is made to lap over about ⅛ inch on each side of the "V."

Q. Is it necessary to support the weld during the operation by placing a flat bar under the weld?

A. No.

A. How many amperes do you use, and what size wire when you make these welds with the arc?

A. Two hundred amperes of current. The first weld is made with 5/22 or 3/16 wire, then followed with a ¼-inch wire.

Q. What is the usual speed when welding the head?

A. Four to seven feet per hour with heavy wire.

Q. Is any attempt made to clean the electric welds?

A. Not to any extent. Any drops that are left by the arc can be chipped off with a chisel.

Q. Do you test your welders before starting them on this work?

A. Yes. The foreman keeps a careful check on the new men and makes sure they can do first-class work before giving them this kind of a job.

In connection with the discussion on the amount of opening to be provided before starting to weld, reference was made to the following extract from a paper, "Welding," read by Charles Hollup before the American Society of Refrigerating Engineers, Milwaukee, Wis., June 7, 1917:

Longitudinal Seams.

In welding longitudinal seams on round tanks, it is first necessary to have a perfectly round shell; that is, the joining ends of the sheet shall not have a flattened section, as customary when coming from the bending rolls. That flat and peaked-looking joint has a tendency of rounding out under pressure, and, in so doing, has a wedging action on the weld, which is often the cause of rupture. The edges of the seam should be beveled as in all other butt welds.

Before proceeding to weld a seam of this kind, expansion and contraction must be considered. These are vital points in welding, and only too often lost sight of. Starting on one edge of the seam, it is necessary to have the edges of the sheet on the far end spread apart. The object is to allow the molten metal, which is then at its most expanded state, to shrink and gradually bring the edges together as the weld is progressing, thereby avoiding shrinkage strains as much as possible. For the same reason I advocate that a seam of that kind should be made at one filling in if possible, or if the sheet is too thick that the heaviest fill be made while the other end is still open. The proper amount of this opening for acetylene welding should equal the thickness of the sheet per foot of length. In other words, a ¼-inch thick sheet 6 feet long should be 6 x ¼, or 1½ inches open on the far end. For electric arc welding about one-half of this is enough.

In preparation for the closing down of the plant due for May 1, the British American nickel plant at Deschanes is gradually reducing its staff. Last week about three hundred men were let go.

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Then They All Rush Together

WHY is it that it is easy to sell equipment to plants when they are booming along and making money, and why is it that much of this equipment arrives about the time the boom is over, when it is as good as useless for serving the purpose for which it was purchased?

The Federation of Engineering Societies, of which Herbert Hoover is president of the executive, is seeking a solution to this question, and a point is brought out in their findings that has been emphasized many times in the columns of Canadian Machinery:

> "Our studies of industries as a whole show that we usually expand our equipments just at the periods of maximum demand for their products, instead of doing our plant expansion during periods of slack consumption. That is one of the factors in our great unemployment problem to-day."

The trouble is that even in our industrial plants, in too many cases we are speculators rather than investors and builders for the future.

When we see things moving, our courage rises. When we see orders starting to come, we get ready to handle them. When we are swamped with business, out go orders for equipment that would have prevented the swamping.

It is a fact that in a season of high productivity, capital is easily interested in enterprises of various sorts. In the great majority of cases it is then, and only then, that the necessity for increased equipment most impresses men's minds, and it is the enthusiasm of these periods that brings expansion, and not the cool, deliberate planning and calculation of less prosperous periods.

The Federation of Engineering Societies may turn this question up on edge, and bore holes in it, but they will not settle it. In the smaller circle of men's lives, we never repair the furnace until the day we want to light it, nor do we think of sharpening the lawn mower until the grass is crowding six inches in height.

The price one pays for a piece of equipment is neither here nor there, if that equipment is going to earn its way when the call for production goes forth.

The trouble is that the request for equipment goes out after many other calls have gone out for similar machines. Then comes the shipping schedule, extending over five, six, or ten months, and in that time the "late-ordering" firm simply has to sit back and watch the business go by.

It might be well if some person with a faculty for turning out pointed phrases would come to the aid of the scrap metal trade. Dealers in recent months have called trade "rotten," "stagnant," "dead," "sluggish," "fierce," etc., with the result that it is now almost impossible to describe conditions without monotonous repetition.

Relation of Prices to Sales

THE U.S. Steel Corporation is being rapped on the knuckles for not pruning its selling schedule and chances are, were the truth known, the same corporation is being entreated not to let its price list get out on the skids.

Were the Corporation to put up the argument that it cannot afford to lower prices, it would immediately meet with the statement that it can.

The National City Bank of New York seems to be of the opinion that the Steel Corporation should lead in the procession toward lower prices and states that "nobody thinks bottom prices have been reached."

Forbes' Magazine, in this connection, goes this far: "The judge's plea that a reduction in prices would not increase demand a single ton has evoked expressions of astonishment throughout the whole industrial and business world, so unsound and indefensible is his reasoning."

Not so fast, here. Can Forbes' Magazine trace the progress of the price slashing of the independents, and see their order books becoming more and more barren as the price cutting proceeded and yet come to any other conclusion than that stated by Judge Gary?

The experience of the steel market does not bear out the idea that cut prices bring in a greater tonnage to the books of the mills.

When a manufacturer wants steel he does not buy because it is cheap or expensive, but because he wants it. He is going to make something with it. If the steel market finds business coming its way on any other basis, it is something new to this paper.

It is a fact that Canadian warehouses are selling less bar mill material to-day around 4c per pound than they were a year ago at 5.75. Were they to drop prices over night to 3c per pound, we doubt very much if orders would start to come.

If low prices bring sales, what is wrong with the scrap metal situation? Go down to-day and you can almost name your own price. Values are away down and even steel mills and foundries are not buying, although they know that when things start to move prices are sure to stiffen.

It is easy to sell in a rising market. Under such conditions the big idea is to get under cover before the next rise comes.

It is equally hard to sell in a dropping or stagnant market.

In the main, we are very much inclined to believe that Judge Gary is quite right when he holds that a cut price brings no more tonnage to the steel mill or the blast furnaces.

A table of figures showing present and 1913 prices in British trade brings out the comparative value of 1913 with 1920 prices. Coal, as declared in 1913, was £6,000; in 1920, it would seem that imports must have increased because they are shown as $27,000, wherein, in reality, at 1913 values, the 1920 imports would show a value of £3,000.

MARKET DEVELOPMENTS

The Liquidating of Stock Takes up Attention

Nothing Heard Definitely From the Steel Corporation About Change in Prices—Toronto Warehouses Anxious to Get Out of Certain Lines in Which They are Overstocked

THE work of liquidating stocks is being carried on, even to rather severe lengths, in a good many Canadian warehouses, carrying steel, iron, small tools, various lines of equipment, etc. The idea seems to be to get cleared out in order that they may take advantage of any new market standards that are coming out from time to time. It is a fact that a number of warehouses are right now acting as commission merchants, in that they find it possible, with factories making immediate deliveries, to send orders direct to the makers, instead of putting in stock for the purpose of filling them. It means that stocks in many lines are being reduced to the smallest possible margin, and that there must be considerable buying done for purposes of replenishment when the business tide turns toward a buying movement of any proportions.

The move toward lower prices seems to have been halted for the present, although some items have been marked down this week. In the steel market, prices are about where they were a week ago, although a number of them are subject to revision according to the size of the order in sight, and the urgency of the buyer for more favorable consideration. Then, again, there are lines which warehouses are rather eager to see move out, and if a buyer shows on the business horizon looking for these particular lines, he is almost certain to get a price well below market levels.

Buying is done in the machine tool market in small lots, and the demand for used equipment seems to occupy the first place in much of the trading.

The scrap metal market is still running in poor luck. Business is about as well fagged out as could be possible. Dealers are not taking on anything, and although prices are very low just now, the customers show no inclination to come out of their hiding, and cover their future requirements.

COMPETITION IS KEEN—ORDERS COME ONLY AFTER KEEN BIDDING

Special to CANADIAN MACHINERY.

MONTREAL, April 7.—Industrial activity in this district still reflects the depression of trade generally, although nature has stepped in to remove some of the tension in the way of unemployment. The opening of the harbor and the work in connection with port developments has helped in reducing the ranks of those "out of work." Considerable replacement and improvement to the service is planned by the Montreal Tramways; this will mean work for several hundred men. The new Mount Royal Hotel, a large office building for the Canada Cement Co. and the new addition to the head office of the Sun Life Assurance Co. are a few of the large construction works that will be carried out this year. Operations will be resumed in the large railroad shops this week, but no assurance has been given of permanent work, owing to the light requirements for repairs and equipment. The metal situation continues quiet, with little movement, but prices are holding relatively firm, tin alone showing a slight decline, the current price being 36 cents per pound. There is a feeling that coppers will strengthen in the near future.

Slight Improvement in Some Quarters

There is an old saying that "coming events cast their shadows before." The remark of a steel dealer here, last week, was of such a cheering nature that it looks as if "the coming of sunshine dispels the gloom of the past." When asked regarding summer outlook, this dealer replied: "I do not mind telling you that our business during the past two weeks has shown gradual improvement. The previous week was the best we had experienced since the beginning of the year, and last week was even better. Friday's orders alone exceeded any two previous days this year. I would not care to say that this will continue but there is every indication that consumers are going from day to day with no more than they actually need. We were asked the other day for some cold drawn stock of a certain size. The customer took the few bars we had on hand, requested immediate shipment of some we had on order, and further instructed us to deliver 125 bars as soon as possible. Much of our business of late has been due to 'rush' wires, showing that the need is urgent."

What tends to substantiate the statement that increased activity is taking place in the automobile industry is the greater inquiry and demand for cars in many quarters. Officials of the automobile association in this district intimate that greater interest is being taken this year than last, and this is reflected in the larger sales of nearly every make of car. This is a development that, in itself, may have no great effect upon the steel operations, but the improvement in motor activity will indirectly affect other lines of enterprise. The rumored revision of prices by the United States Steel Corporation, to take effect later in the month, has created a feeling of expectancy in many quarters, and has likewise caused some exhibition of nervousness. It is thought that this has been timed to coincide with the action of the railroads, in their attitude towards labor, as it is generally recognized that the wage question must be adjusted before normal industrial activity can be resumed. The steel situation here is unchanged generally, but with some dealers reporting slight improvement, consumers buying conservatively. No

nual statement for wiping some of this material out, and it has been moving now. The result is that the customers are getting good close prices, and the warehouse is being enabled to get rid of material without liquidating at a loss. One sign that the smaller shops are doing some buying is the increase in the call for carbon drills. In the larger shops high speed steel is called for almost entirely.

In the Steel Market

"Looking back over the business of the month of March, we found that sheets had been about the best selling line we had," stated one steel merchant. "This refers to both black and galvanized. A number of industries contributed to this result." The movement in sheets is helping warehouses to get rid of their stocks, which are still fairly heavy, but well assorted.

The total volume of business done in tubes for the first quarter of 1921 has been disappointingly small in many cases, but the season should still be good. Buying is being done on a very small basis. There are cases, some of which we heard about in the market this week, where several large boilers should be attended to, but the proprietors are holding back hoping for a better price, which, considering the amount of tubing in a good-sized boiler, would amount to quite an item.

This week has its fresh crop of rumors about prices on steel being raided by a new price to be brought out by the Steel Corporation. Rumors have been so numerous of late that the chances are that they have little bearing on the market. Neither warehouses nor manufacturers have been buying freely. The general feeling is that the Steel Corporation is the only agency that can stabilize the steel market, and until some move is made by the Corporation, affairs in the steel world will be more or less uncertain.

There seems to be a tendency on the part of dealers to hold prices up pretty well to their schedule. This depends largely on whether there is a desire to get rid of a line, or whether they can afford to carry it along. For instance, iron bars are quoted around 4.25, while some sales are being put through at 4c. Where a warehouse is heavily stocked in a line that he is not desirous of retaining at the present tonnage, one might get a figure as low as 3.75, but that would not represent the market. The bulk of the sales are being made between 4c and 4.25c.

Selling Small Tools

Small orders for small tools seems to describe the situation, if one is to accept all the stories of the dealers who are out scouring the markets for orders. Complaint is also made that selling schedules are being pruned at all corners in order to secure orders.

Dealers in the scrap metal business have plenty of time to discuss the situation in their field just now, for they have little else to do. There is nothing to show any improvement in their lines. Yards generally are loaded with copper to such an extent that they will be busy getting out from under as best they can for some time. The small dealer is more or less out of the running entirely, especially the man who goes around the country doing his own collecting. Prices are all against him, and he is sorely tempted to drop out until things turn for the better.

PITTTSBURG BELIEVES THE STEEL BREAK HAS ALREADY SEEN ITS CLIMAX

Special to CANADIAN MACHINERY.

PITTSBURGH, April 7.—The iron and steel situation is now clearly defined. Any doubt there may have been as to the nearby future of the trade is resolved, as there has been buying in the past few weeks and the character of the buying is well established. When there was a complete absence of demand there was naturally doubt as to what would be the character of the demand when any developed.

Practically the universal experience of the steel producers is that of doing a carload business. That is true of the Steel Corporation quite largely when it receives releases on orders previously held up, though the Corporation does receive some releases of larger volume, and it is the usual experience of the independents when receiving new orders. It is only occasionally that a good sized order is placed, this being for some piece of construction work. The regular manufacturing consumers, as well as the jobbers, are calling for material in carload lots. In many cases the specifications show that the material called for is required to piece out on stocks already in hand. Some jobbers and manufacturing consumers have gotten to the point where they need to take steel in general, but in most cases it is a matter of rounding out stocks, which have been getting ragged.

There is nothing that can be called a "spring demand" and that is distinctly disappointing. There was no occasion for disappointment in January, when predictions made in December that there would be a revival in demand after the turn of the year failed of verification, for such predictions had not been well founded. January is not a month in which steel demand normally increases. March is such a month. The rate of steel consumption at the beginning of April does not appear to be larger than the rate at the beginning of January, and probably it is less. It is true that some industries are more active, much stress being laid upon this fact in various reports, but on the other hand many industries are less active, and not much is said about that.

Steel Prices

There is no deadlock on steel prices. Buyers give no intimation that there is any price at which they would really take hold. If there were any large demand to be developed by reducing prices the United States Steel Corporation would undoubtedly make the reductions it is certain to make eventually. The majority of the Steel Corporation's customers seem to be well satisfied with the Corporation's policy of holding to the Industrial Board schedule, and they could hold this view for no other reason than from having stocks of raw or manufactured material they wish to liquidate on the best terms possible. Of course those who are in the market to make fresh purchases secure the lowest quotations obtainable, but their buying is of small volume. While the total quantity of material now being specified is small, the probability is that the bulk of it is in the form of specifications against old contracts or releases for shipment against orders previously held up. In the case of the Steel Corporation this business is, of course, at the regular Corporation or Industrial Board prices, while in the case of the independents there are probably adjustments to the existing independent market as commonly quoted.

Bars remain quotable at 2c for carload lots with desirable specifications, shapes and plates being correspondingly 2.10c. These prices were possible a month ago, but concessions obtainable on large lots are probably smaller now than then. Seeing that it is two months since the independent market broke, and there has been no actual decline in these three important commodities for a month, it is plain that the break is over. The independent market is more or less stabilized, and the next important development will probably be the Steel Corporation's reduction, which may occur very soon or not for several months. While it is always somewhat dangerous to prophesy, there is reason for making this prediction. With their very light operation the independents have high costs, much higher than they would have with the same wage rates and raw material costs. They could reduce their production costs by having a larger operation, and that would be an incentive to cut prices further, but if much more business were to be obtained by making prices the Steel Corporation would be influenced by the condition as well, and would reduce its prices. Hence it seems reasonable to conclude that the independents are unlikely to reduce their prices much if at all until the time comes for the Steel Corporation to make its reduction. The common view is that when the Cor-

price changes are recorded and those quoted are more or less nominal. The surcharge on freight shipments for the current period is slightly improved, it being 8 per cent. in place of 9 per cent., the new rate being effective on April 1.

Commenting on conditions here as compared to those in the States, a business man associated with the machine tool activity stated last week that he believed that Canada was better off, just now, than any other country in the world. Industrial conditions in the States are much worse than here and the outlook for the summer is still uncertain. Another dealer remarked that business had been better, especially in contractors' supplies for construction work. Metal working machine tools were not in heavy demand, and supply requirements of the smaller order had been light. "It is a market where competition is pronounced," said a salesman, "if you keep everlastingly at it you will get results, but you have to be prepared to 'meet the other fellow.' Just last week we had an inquiry for some material made in Hamilton, for which we were quoting 6½ cents; Toronto was asking 6¼ cents. We closed at 6¼." Consumers and users of tools are keenly alive to the situation and endeavor and usually succeed in getting the very best price.

No Scrap Export Now

The war has effected some surprising changes in business conditions, and not the least of these is that shown in the movement of old materials. When asked what influence the opening of navigation would have on the scrap market, one dealer here replied: "Very little. Before the war we did considerable business shipping scrap overseas, but this is now only a memory. The accumulation of scrap in England and Europe is past calculation and it will take years before conditions get back to what they were, and there is a possibility that this time may never come, owing to the complete change of the industrial outlook. Come down in the basement and I'll show you something." He escorted me to the cellar and confronted me with a pile of copper bands that had been made for 8 and 9-inch shells, but which had never been used. At a rough estimate there was upwards of 50 tons in this pile and he said there was more. The price paid for these bands was in excess of what could be realized on the market to-day. The continued dullness in steel activity has resulted in a further softening of prices and quotations on heavy melting steel and old rails have been marked down from $15 to $12 per ton. Machine shop turnings are now quoted at $6, a decline of $2 per ton. Other steel scraps are unchanged but nominal. Non-ferrous scraps are moving lightly with prices easier. Coppers are showing weakness, crucible declining ½ cent to 11 cents per pound. Heavy lead is likewise quoted ½ cents off at 4 cents per pound.

POINTS IN WEEK'S MARKETING NOTES

New York expected a couple of weeks ago that a buying movement was fairly well under way, but it has fallen off sharply since.

—

Export trade in machine tools for United States builders continues to be very dull. Japan navy and arsenal have been doing some buying.

—

Announcements of reductions this week come from a maker of planers and another from a radial drill firm. Chain blocks are also marked down about 15 per cent.

—

Pittsburgh goes as far as to claim that the break in the price of steel is over, although the announcement of the Corporation on its prices is yet to come. Others hold that it will call for a cut in prices and in wages at the same time.

—

Selling out present stock is the one big idea of a good many of the warehouses in Toronto. Sizes not required are being let go at a close figure.

—

Dealers claim that a fair amount of business is now coming from small shops that have not been buying anything for a long time because travellers had been passing them by.

—

Small tools, particularly drills and in some cases files, are being sold at close figures, and complaint is being made that makers are selling at closer prices than the jobbers.

—

The scrap metal market has few bright spots. Dealers are waiting for the turn, welcoming anything that comes, in the belief that it cannot be worse, and therefore must be for the better.

MOVING STOCKS THE PROBLEM

Warehouses for the Present Prefer to Send Orders Direct to the Manufacturer

TORONTO.—One of the outstanding features of the market in this district, especially in iron, steel and many lines of tools, is the feeling that prices quoted in the various lines are not stable enough to warrant much business being placed on the strength of them.

Several of the machine tool men claimed that during the month of March there had been a slight improvement in the general tone of business, and when the figures for the month had been totalled up, it was found there had been a very fair volume of trade.

Firms handling used equipment as well as new seem to be having the edge on the others in securing the volume of trade just now. There continues to be a demand for used material, and there is still a large amount of this available. Several of the war shops were never entirely cleared out, and steps are being taken now to dispose of equipment in these.

Thinning Out the Stock

Getting rid of the stock seems to be the problem of warehouses in many lines of business, in fact those that have anything they are not willing to talk price on are very much in the minority at the moment. The manager of a large selling agency in Toronto showed a representative of this paper through a number of the departments of that business. In many departments one could see the red tags on the bins, which would, under ordinary circumstances, mean that their supply had run out of that particular line, and orders should be placed at once for sufficient to last from three to six months. Just now the firm seems to be particularly pleased with the increase in these red tags, as they are not placing orders as soon as a red tag shows up.

Speaking to Canadian Machinery of their present selling and buying policy, the manager stated: "We find that we can get along for the present without putting in large stocks. When we got on the basis of sufficient for a month only, we found that by the time the shipment would come in there would be an accumulation of orders, and the stock seemed to come in and get right out again. Then there are other lines where we can get very ready service from the manufacturers. Orders can be sent along from our customers, and until prices get a little more stabilized it is just as satisfactory for us to send orders direct to the makers, and have shipments made from there to our direction. We are busy getting rid of stock, not taking more on."

This is true of several lines of business, and while for the present it does not mean large buying, it does mean that stocks all over are running very low, and when demand quickens there will be very heavy buying done.

Changes in Demand

Another very odd thing has come to light within recent weeks, viz., that several lines are being moved which have been standing still for a long time, in some cases for years. In some cases salesmen are calling on shops again which they have missed for a long time. They were not in the war work rush, and only recently have salesmen, in their chase for orders, looked them up. Their buying is not large, but it has called for some lines that have been standing still. In one place, we know that a certain amount has been written off in the an-

poration acts on prices it will endeavor to make one reduction that will cover the whole ground.

The market on standard steel pipe has become decidedly irregular, following the slight shading reported a week ago. Extra concessions of 2½ or 5 per cent. that were formerly given only to the very largest trade are now more or less common property with carload buyers, and, of course, there is ground for supposing that the large buyers could get extra concessions. Line pipe, which has been shaded for quite a while, is going at closer and closer figures as inquiries develop.

The sheet market is lower by about $2 a ton on black and $4 on galvanized, at 3.75c for black and 4.80c for galvanized. These prices can be done on carload lots if the specifications are attractive. On large lots the concessions from the carload price are less than when the carload market was higher, and it is not altogether certain that any concessions could be secured, except on the heavy gauges of galvanized, the difference in production cost between heavy gauge and 28 gauge being greater than the gauge differentials in the standard list.

Coke Developments

The coke market at last shows approximately where it stands, a sale of 500 tons a day for five or six weeks having been made by one of the largest operators to the furnace at Portsmouth, O., which is to go into blast and needs Connellsville coke for a while, until it gets its by-product coke plant in operation. The old claim was that it cost $5 a ton to make furnace coke. A few weeks ago one of the large operators made a wage reduction, announced to average 18 per cent., and some other operators made reductions. About a fortnight ago it became known that some other operators intended to reduce wages and some of those who had made reductions intended to make a further reduction. Apparently at the last moment word went around and practically all the independent operators announced the restoration of the scale of November 10, 1917, effective April 1. This seems to make the wage rate uniform, except that the H. C. Frick Coke Company (Steel Corporation) has taken no action, its intention evidently being to act when the Steel Corporation makes its general wage reduction at the furnaces and mills.

The independent scale now in force is approximately 30 per cent. below the old scale, which went into effect last year, and of course materially reduces the cost of production, this accounting for the $3.75 sale reported above, which is the most important business done since it became settled that the 1917 wage scale was to be restored. Foundry coke for spot shipment remains quotable at $5 to $6, according to brand, but is likely to settle some in sympathy with furnace coke.

Pig iron remains quotable at $25, valley, for Bessemer, foundry and malleable and $23 for basic. These prices could possibly be shaded a trifle on inquiry for a fair-sized lot.

THE NEW YORK MARKET SPOTTY

Hopes of a Revival in Machine Tool Circles Prove To Be Rather Short Lived

Special to CANADIAN MACHINERY.

NEW YORK, April 7.—Hopes which the machine tool trade entertained about two weeks ago of a moderate resumption of buying have apparently gone a-glimmering, for the moment, at least. The past week has been exceedingly dull locally. Some of the companies which have come into the market for shop equipment appear to be in no hurry to buy, and wherever possible are scaling down their estimated requirements. For example, the General Electric Co., which inquired a few weeks ago for about 30 machines for its Schenectady shops, found that by moving machines from one department to another it could eliminate many of the items on its list. The American Sugar Refining Co., which inquired for about 50 tools for its Baltimore refinery repair shop, has bought a few fabricating machines and pipe machines, but the rest of the list being held up, temporarily at least. Nor have orders been received here from the Batavia Car Works, Batavia, N.Y., which issued a list of about 25 machines a few weeks ago.

Railroad inquiries, which have covered only a few machines in each instance, are mostly being held up, but the Bangor & Aroostook Railroad bought a 600-ton car wheel lathe. The list of the Virginian Railroad, comprising about ten or twelve machines, is being held up indefinitely.

The Western Electric Co. has been a fairly consistent buyer of late, both for its domestic plants and for its plant in Japan. The Japanese Government, which has already bought a considerable number of machines for its navy, is also reported about to buy for its arsenals. On the whole, export trade continues very dull.

The Singer Manufacturing Co., New York, manufacturer of sewing machines, is in the market for locomotive cranes, travelling cranes and machine shop equipment for a plant in Canada. Little is known here as to its exact requirements, it being stated that the equipment will be purchased in Canada.

Further price reductions are announced. A leading manufacturer of planers has reduced about 10 per cent. and radial drills have been cut a like amount.

Pig Iron Market

In most centres pig iron sellers have been able to check the downward trend of prices on moderate tonnages, but further weakness has developed at Cleveland and Chicago.

The little spurt of activity of a week ago has subsided as quickly as it developed. A fair number of small lot orders for foundry iron for prompt shipment have been placed generally at $25, valley furnace, for No. 2 grade. Some makers of this grade are not disposed to go below $26, but the willingness of others to accept business at $25 makes it difficult to sell at a higher figure.

The pig iron market at Chicago still lacks stability, but the downward trend of prices is less marked than heretofore, possibly because producers are getting down to bed rock costs.

An increasing number of melters in the New York district, who have refrained for a long time from buying, are being compelled to come into the market, and are placing orders for early delivery. This does not mean heavy buying, but a little improvement over recent extreme dullness can be noted.

The situation in New England in foundry pig iron is somewhat clarified by cash readjustment on contracts, a general practice of late. There is a better demand and slightly less than 1,000 tons reported as being sold the past week.

Foundries generally are melting somewhat more iron than they have been and the Belleville, Ill., stove foundries have opened up on orders received, while the St. Louis stock foundries report that new orders are coming in and causing interest in pig iron to meet the contracts that are in prospect.

Philadelphia reports that although the foundry iron market had settled to a basis of $25 furnace on any attractive orders, most of the business taken in the past week has been nearer $26 furnace. The Brooke furnace will go out of blast within a week or ten days, leaving only two regular merchant furnaces, Warwick and Swede, in blast in eastern Pennsylvania.

CHINA LOOKING TO THE FUTURE

The Government of the Chinese Republic has inaugurated a Bureau of Economic Information for the dissemination of information relative to economic, commercial, financial and industrial development within the boundaries of the Republic of China. This information is being published semi-monthly, in pamphlet form, the first of the series showing the date of January 25th, 1921. Communications from outside countries should be addressed to Government Bureau of Economic Information, Box 653, American Post Office, Shanghai, China.

India As a Market For Canadian Iron and Steel

Some Canadian Steel Lines Have Been Fairly Well Established in Those Markets—Greater Care is Necessary in Packing And Studying the Likes and Preferences of the Buyers There

THE markets of India as a possibility for Canadian iron and steel goods is dealt with at length by H. R. Poussette, director of the Canadian Commercial Intelligence Service. Where reference is made to money it should be noted that the nominal value of the rupee is now two shillings or one-tenth of the gold contents of a sovereign. Its actual present value is about 1s. 4d. to 1s. 5d.; just over a year ago it was 2s. 10d. A lac of rupees is 100,000 rupees, and is written 1,00,000; a crore equals 100 lacs. In India the rupee is divided into 16 annas, and the annas are further subdivided into 4 pice. In Ceylon the rupee is divided decimally.

Iron and steel in various forms is imported into India in exceedingly large quantities, as a reference to statistics will show. At the present time there are three producing companies organized in India; the Tata Iron and Steel Company, a very important concern which manufacture at Jamshedpur, about 150 miles west of Calcutta; the Bengal Iron Company, which make iron, ferro-manganese and iron products at Kulti, some 140 miles from Calcutta on the East Indian railway; and the Indian Iron and Steel Company, which it is expected will commence manufacturing pig-iron about the middle of 1921.

India contains fairly large quantities of coal, mostly situated in the provinces of Bengal and Bihar, and deposits of iron ore, which are said to be almost inexhaustible, are found in Singhbhum district, Chota Nagpur, and in which very large claims have been staked out by the three Indian companies already mentioned. The iron ore is said in certain locations to have a depth of from 2,000 to 3,000 feet, part of which is below and part above sea level.

Iron and Steel Products

Very little is heard of Canadian steel in this market, although a certain amount has found its way to India. One firm in Madras stated that they were importing both iron and steel from Canada, and this was one of the few instances where mention was made of Canada in this connection. Considering the huge business which the United States have worked up in India in iron and steel products, there seems no reason why the Dominion, particularly now that direct steamship connections have been established, should not be able to do a considerable amount of business in this market. The imports of steel angles and springs in the fiscal year 1919-20 amounted to over Rs. 52 lacs, and the imports of steel bars and channels to over Rs. 2 crores, of which the United States exported no less than Rs. 1,08,00,000, or about £1,000,000. Of the total of bars and channels imported, the United Kingdom supplied to a value of about Rs. 74 lacs. The trade for April and May, 1920—the first two months of the financial year—amounted to 28,421 tons, of which the United Kingdom supplied 18,000 and the United States about 4,500 tons.

Canada has competed in Japan and China in steel bars, and is possibly doing so today; accordingly our steel mills should be able to do equally well in India. It is very likely that the supplies sent into this country will continue to be heavy if not to expand over a number of years. One firm stated that if they could be assured of receiving supplies from the Dominion they would be prepared to take 30,000 tons of mild steel a year, spread over girders, bars, angles, tees, rods, plates and sheets. Importers stated that there is a very good market for tool steel in squares, rounds, flats, hexagonals and octagonals, ¼ inch to 3 inches. There is a certain amount of faggot steel imported into Burma, and possibly into other parts of India. In the former country these are manufactured into big knives called dahs, which are almost always carried by the jungle natives. These knives are also made of bar iron and edged with Milano steel.

In connection with the steel business, it should be mentioned that a good deal of it is done on a consignment basis—in fact, the head of a very large importing house stated that practically all British steel manufacturers do a consignment business in India, and the same remark applies to wire rope.

American steel manufacturers appear to be very determined to make themselves supreme in the Indian market, and some of them have opened up their own offices. It is understood that the largest of these will carry heavy stocks, and supply their customers from their own godowns, as is their practice in other parts of the world. This is undoubtedly a sound as well as an aggressive policy, and one that will probably be very well rewarded in the future.

Canadian Wire There

Canadian wire is well known in this market, but appears to be considered by dealers to be somewhat dull in appearance. One large importer stated that the pre-war German wire was the very best he had ever handled, but in his opinion the article turned out in the United States today is exceedingly satisfactory, and one point upon which he was very strong was that the packing of the latter was the best in the world.

It is pleasing to note that Canadian woven wire fencing has firmly established itself on this market, and is probably more used than the make of any other country, although very few in India are aware of the fact. There is a certain, but by no means extensive, demand for wrought iron gates. One dealer was very interested in a gate which he had seen in Canada, which opened automatically on approach, and was anxious to obtain one.

Wire netting, which should be painted green, is in considerable request. This is imported from the United States in 12, 14, 16 and 18 mesh, 3 feet wide, and in rolls of 50 feet, and also 8 by 8 to the inch—which latter is used for rice mills. On tea estates a good deal of 19 gauge wire netting is employed in the withering houses, ½ and ¾ mesh and 3 feet wide.

Bolts and Nuts

Bolts and nuts are made in India near Calcutta, but as the figures show, this local industry is not able by any means to supply the requirements. The imports for the fiscal year 1919-20 amounted to nearly Rs. 26 lacs, of which the United Kingdom supplied to the value of about Rs. 14 lacs, the United States about Rs. 10 lacs, and Japan a little over a lac. It is interesting to note how the trade of the United Kingdom jumped up in the year referred to, while that of the United States and Japan, and particularly the latter, fell away. Apparently Canadian bolts and nuts have come into this market, as one dealer stated that he had handled them, and that they were quite satisfactory. He mentioned that the packages were a little short in weight, being 112 pounds gross instead of 110 pounds net, the latter being the weight to which the Indian market is accustomed.

Must Please the Eye

Canadian nails are very well known but are not thought so well finished or well polished as the American, which in a market like India, where appearances count for so much, militates against their sale. Very large stocks of wire nails are carried by the principal importers, and one of them pointed out in his godown no less than 12,000 kegs. Unfortunately several shipments of Canadian nails arrived here some time ago, and, owing probably to mishandling in transhipment, the kegs on arrival in Calcutta went to pieces. The consequence of this was that the importers suffered a considerable loss, one of them putting it as high as 50 per cent., although that is probably somewhat exaggerated. With regard to the appearance, the difficulty does not lie so much with the ultimate consumer as with the bazaar merchants, who profess fear that if the nails are not

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$26 00
Lake Superior, charcoal, Chicago	40 50
Standard low phos., Philadelphia	41 50
Bessemer, Pittsburgh	28 96
Basic, Valley furnace	26 00
Toronto price:—	
Silicon, 2.25% to 2.75%	39 25

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 25
Steel bars, base, Toronto	4 25
Iron bars, base, Montreal	4 25
Steel bars, base, Montreal	4 25
Reinforcing bars, base	4 25
Steel hoops	5 50
Tire steel	5 00
Spring steel	8 00
Band steel, No. 10 gauge and 3-16 in. base	4 75
Chequered floor plate 3-16 and heavier	6 50
Bessemer rails, heavy, at mill	2 35
Steel bars, Pittsburgh	2 10-2 25
Tank plates, Pittsburgh	2 65
Structural shapes, Pittsburgh	2 45
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small shapes	4 50
F.O.B. Chicago Warehouse	
Steel bars	3 48
Structural shapes	3 58
Plates	3 78
Small shapes under 3-in.	3 48

FREIGHT RATES

Per 100 Pounds.

Pittsburgh to Following Points

	C.L.	L.C.L.
Montreal	58½	73
St. John, N.B.	84½	106½
Halifax	86	108
Toronto	38	54
Guelph	38	54
London	38	54
Windsor	35	50½

Current surcharge, 8 per cent.

METALS

	Gross. Montreal	Toronto
Lake copper	$18 00	$17 50
Electric copper	17 50	17 50
Castings, copper	17 25	18 00
Tin	36 00	39 00
Spelter	7 75	7 50
Lead	6 50	7 50
Antimony	8 00	8 25
Aluminum	34 50	30 00

Prices per 100 lbs.

PLATES

Plates, 3-16 in.	$5 25	$4 75
Plates, ¼ up	4 75	4 25

PIPE—WROUGHT

Standard Buttweld Pipe S/C

Per 100 feet.

Size	Steel Blk.	Steel Galv.	Gen. Wrot Iron Blk.	Gen. Wrot Iron Galv.
⅛ in.	$ 6 50	$ 8 50	$	$ ....
¼ in.	4 89	6 99	5 91	8 01
⅜ in.	4 89	6 99	5 91	8 01
½ in.	6 50	8 03	7 95	9 48
¾ in.	7 99	10 06	9 95	12 02
1 in.	11 82	14 88	14 71	17 77
1¼ in.	15 99	20 13	19 90	24 04
1½ in.	19 11	24 06	23 79	28 74
2 in.	25 72	32 38	32 01	38 67
2½ in.	40 66	51 19	.....	.....
3 in.	53 17	66 94	.....	.....
3½ in.	67 62	84 18	.....	.....
4 in.	80 12	99 74	.....	.....

Standard Lapweld Pipe S/C

Per 100 feet.

Size	Steel Blk.	Steel Galv.	Gen. Wrot Iron Blk.	Gen. Wrot Iron Galv.
2 in.	$29 42	$36 08	$35 71	$42 37
2½ in.	44 17	54 70	54 11	64 64
3 in.	57 76	71 53	70 76	84 53
3½ in.	69 46	86 02	85 10	101 66
4 in.	82 30	101 92	100 83	120 45
4½ in.	95 89	1 20	1 30	1 54
5 in.	1 12	1 40	1 52	1 80
6 in.	1 45	1 81	1 97	2 33
7 in.	1 89	2 37	2 53	3 01
8L in.	1 99	2 49	2 66	3 16
8 in.	2 29	2 87	3 07	3 64
9 in.	2 74	3 43	3 67	4 36
10L in.	2 54	3 18	3 41	4 05
10 in.	3 28	4 10	4 39	5 21

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4-in. and under, 50 per cent.

4½-in. and larger, 40 per cent.

4-in. and under, running thread, 20%.

Standard couplings, 4-in. and under, 20%

Dd., 4½-in. and larger, net.

OLD MATERIAL

Dealers' Average Buying Prices

Per 100 Pounds.

	Montreal	Toronto
Copper, light	$ 9 50	$ 9 00
Copper, crucible	11 00	11 00
Copper, heavy	11 00	11 00
Copper wire	11 00	11 00
No. 1 machine composition	10 00	9 75
New brass cuttings	7 00	8 00
Red brass turnings	8 00	8 00
Yellow brass turnings	6 00	6 00
Light brass	5 00	5 00
Medium brass	6 00	6 00
Scrap zinc	4 00	4 00
Heavy lead	4 00	4 00
Tea lead	2 00	2 00
Aluminum	12 00	10 00

	Per Ton	Gross
Boiler plate	$11 00	$12 00
Heavy melting steel	12 00	14 00
Axles (wrought iron)	25 00	20 00
Rails (scrap)	12 00	14 00
Malleable scrap	20 00	20 00
No. 1 machine cast iron	30 00	25 00
Pipe, wrought	8 50	8 00
Car wheel	30 00	25 00
Steel axles	20 00	18 00
Mach. shop turnings	6 00	6 00
Stove plate	23 00	20 00
Cast boring	5 00	7 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, 7-16 and up	Net list
Carriage bolts, ⅜" and less	15
Coach and lag screws	—20
Stove bolts	55
Wrought washers	—25
Elevator bolts	Net
Machine bolts, 7-16 and over	—5
Machine bolts, ⅜-in. and less	—30
Blank bolts	Net
Bolt ends	—5
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	+25
Machine screws, fl. and rd. hd., brass	Net
Machine screws, o. and fil. hd., brass	Net
Nuts, square, blank	+25 add $2 00
Nuts, square, tapped	add 2 25
Nuts, hex., blank	add 2 25
Nuts, hex., tapped	add 2 75
Copper rivets and burrs, list less	27½
Burrs only, list plus	10
Iron rivets and burrs	37½ and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	67½
Wood screws, flat, bright	67½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent
Set screws	Less 40%
Square and hexagon head cap screws	Less 30%
Round head cap screws	Plus 10%
Fillister head cap screws	Less 10%
Flat head cap screws	Net list
Button head cap screws	Plus 10%
Studs	Less 20%
Semi-finished nuts up to and including 1-in.	Less 35%
Semi-finished nuts 1⅛ to 1½"	Less 30%
Semi-finished nuts 1⅝ to 2 in.	Net list
Coupling bolts	Plus 10%
Taper pins	Less 40%
Planer bolts without fillet	Plus 40%
Planer bolts with fillet	Pus 50%
Patch bolts	Plus 80%
Hollow set screws	Plus 20%
Thumb screws	Less 35%
Thumb nuts	Less 65%

BILLETS

F.O.B. Pittsburgh.

	Per gross ton
Bessemer billets	$43 50
Open-hearth billets	43 50
O.H. sheet bars	47 00
Forging billets	48 50
Wire rods	57 00

NAILS AND SPIKES

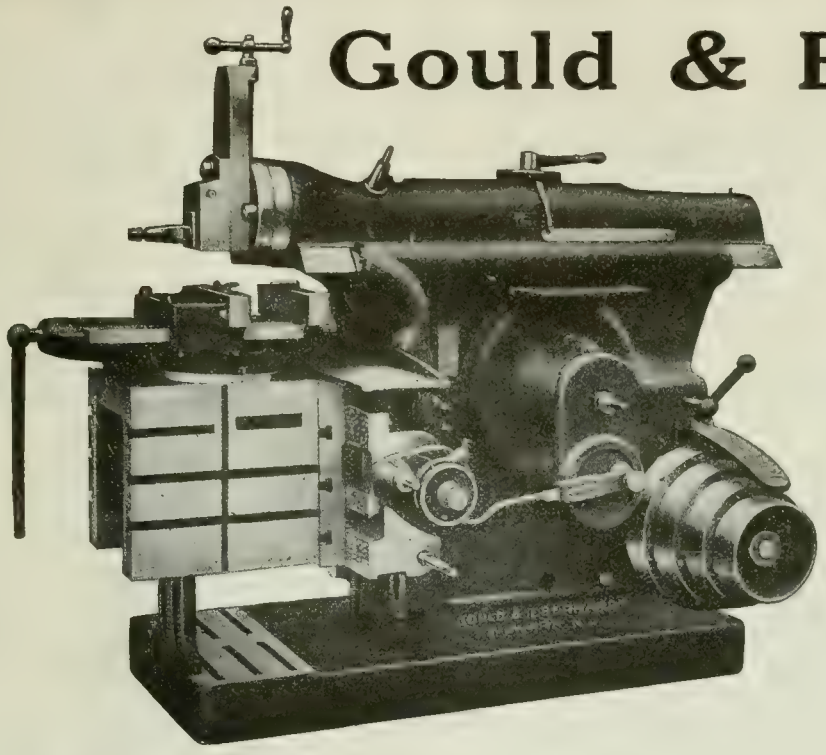
Wire nails, base	$5 10
Cut nails, base	5 75
Miscellaneous wire nails	50%

ROPE AND PACKING

Plumbers' oakum, per lb.	0 10¼
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 26
British Manila rope	0 20
New Zealand hemp	0 20

POLISHED DRILL ROD

Discount off list, Montreal and Toronto	Net



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bright their customers will not take them off their hands.

There is a good market for nails for horse shoes and also for bullock shoes between 1¼ to 1½ inches.

All wire nails arrive on the market packed in kegs containing 100 pounds net, but it was stated by one or two importers that there seems no reason why they should not come out in cases of 45 to 50 pounds. Referring to American packing, one importer drew attention to some kegs of American nails to prove his point as to the excellence of their method. These kegs had wire hoops at the top and bottom, and other hoops four inches from each end. The ends of the wire were firmly twisted together and the hoops, which were fixed with staples driven in at intervals, had apparently been hammered over the ends of the keg. The breakages among American kegs are said to average not more than 1 per cent. Apparently the bazaar prefers wire nails with chequered heads.

Scrap Metal Market

On the Pittsburgh scrap market prices continue to seek lower levels, due to the fact that few of the steel manufacturers are showing any interest in the market, and as the dealers who have yards see no immediate prospect of an improvement in business, they are reducing their bids against material for laying down on their yards. Heavy melting steel has been offered at $13.50 per gross ton delivered.

Prices on most grades have again dropped from 50 cents to $1 per ton on the Chicago market. Buying is at a standstill as both sellers and users are inactive. Railroad lists are also not attractive to carriers.

The chief activity at New York on the scrap market is in turnings, but these have declined $1, $9 delivered Phoenixville being about the best price obtainable.

There is a little activity in stove plate, cast and heavy melting steel on the Buffalo market, but not to be compared with a normal market. A tonnage of stove plate was recently bought at $19, but this was a top price. Ten dollars is the top price offered by a local consumer, which is not getting any heavy tonnage at this price.

The scrap market continues to be almost lifeless at Cleveland. A local mill is offering $13 for select heavy melting steel scrap to lay down in its yard, but with this exception consumers are staying out of the market. The supply is becoming somewhat more plentiful owing to the resumption of a few Cleveland plants making automobile parts, and this is having a tendency to make prices weaker. Dealers are showing some anxiety to the attitude of mills over the acceptance of high-priced scrap, a great deal of which they have on their order books at prices up to $30 or higher for heavy melting steel.

POINTS FOR TWIST DRILL USERS

If the drill chips on the edge it indicates that the lip clearance is too great and fails to support the cutting edge. This may be because the drill is too hard. It is advisable to ease off on the feed and watch the grinding.

If it splits in the web, it is either ground with improper centre lip angle or the feed is altogether too heavy. The centre lip should be at about 45 degrees to the cutting lips of the drill. The drill is in best condition when the chip comes out in a close coil.

If the outer corners wear it shows that the speed is too high and it should be reduced. This is particularly noticeable in drilling cast iron.

Drilling cast iron can be done at a little faster speed than for steel, but the corners must be watched.

MISCELLANEOUS

Solder, strictly	$ 0 25
Solder, guaranteed	0 27
Soldering coppers, lb.	0 62½
White lead, pure, cwt.	17 00
Red dry lead, 100-lb. kegs, per cwt.	13 00
Linseed oil, boiled, single bbls.	1 03
Wood alcohol, per gal.	2 75
Whiting, plain, per 100 lbs.	3 00

CARBON DRILLS AND REAMERS

S.S. drills, wire size	40 and 5
Can. carbon cutters, plus	10
Standard drills, all sizes	40 and 5
3-fluted drills, plus	10
Jobbers' and letter sizes	40 and 5
Bit stock	50
Ratchet drills	10
Pure turp., single bbls., gal.	1 20
Linseed oil, raw, single bbls.	1 00
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	25 off
Drills and countersinks	Net
Bridge reamers, carbon	50
Centre reamers	5
Gasoline, per gal., bulk	0 42
Chucking reamers	Net
Hand reamers	10
High speed drills, list net to plus	20
Can. high speed cutters, net to plus	10
American	plus 40

COLD ROLLED STEEL

[At Warehouse]

Rounds and squares	$7.00 base
Hexagons and flats	7.00 base

IRON PIPE FITTINGS

	Black	Galv.
Class A	60	75
Class B	26	36
Class C	17	26

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 6 50	$ 6 50
Sheets, blue ann., No. 10	5 50	5 50
Canada plates, dull, 52 sheets	12 00	13 00
Can. plates, all bright	14 00	.....
Apollo brand, 10¾ oz., galvanized	.....	.....
Queen's Head, 28 B.W.G.	10 75	.....
Fleur-de-Lis, 28 B.W.G.	10 00	.....
Gorbal's Best, No. 28	.....	.....
Colborne Crown, No. 28.	.....	.....
Premier, No. 28, U.S.	8 75	8 50
Premier, 10¾-oz.	8 25	8 90
Zinc sheets	13 00	15 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13; 5-16, $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅝ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13; 5-16 in., $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClennand, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES

Size	Seamless	Lapweld
1 in.	$26 00	$.....
1¼ in.	27 25	.....
1½ in.	26 25	29 50
1¾ in.	29 75	27 00
2 in.	29 25	24 50
2¼ in.	33 00	28 50
2½ in.	44 75	32 50
3 in.	49 25	40 00
3¼ in.	.....	48 50
3½ in.	63 50	43 50
4 in.	85 00	55 50

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS

Castor oil, per lb.	—
Royalite, per gal., bulk	28
Palacine	31
Machine oil, per gal.	58
Black oil, per gal.	27
Cylinder oil, Capital	1.01
Petroleum fuel oil, bbls., net	11.2

BELTING—No. 1 OAK TANNED

Extra heavy, single and double	15%
Standard	15 and 10%
Cut leather lacing, No. 1	2 00
Leather in side	2 40 3 00

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	$4 50
Polishing wheels, bull-neck	2 00
Emery in kegs, Turkish	8¾
Pumice, ground	06
Emery glue	30
Tripoli composition	9½
Crocus composition	12
Emery composition	11
Rouge, silver	64
Rouge, powder, nickel	38

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	8½
Grits, 80 and finer	6

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	30
Brass sheets, 24 gauge and heavier, base	38
Brass tubing, seamless	42
Copper tubing, seamless	44

XXX Extra	21
Peerless	22
Grand	21½
Superior	21½
X L C R	16½
Atlas	19
X Empire	15
Ideal	18
X Press	13½

WASTE

Colored

Lion	13½
Standard	12
No. 1	14
Popular	10½
Keen	9

Wool Packing

Arrow	35
Axle	28
Anvil	22
Anchor	17

Washed Wipers

Select White..20 Dark colored.09
Mixed colored.10

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ....10% Best grades..15%

ANODES

Nickel	.55 to .60
Copper	.38 to .40
Tin	.70 to .70
Zinc	.16 to .17

Prices per lb.

COPPER PRODUCTS

	Montreal	Toront
Bars, ½ to 2 in.	$30 00	$34 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	32 00	38 00
Copper sheet, tinned, 14 x 60, 14 oz.	38 00	42 00
Copper sheet, planished, 16 oz. base	44 00	48 00
Braziers', in sheets, 6 x 4 base	36 00	41 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$ 9 50	$14 50
Sheets, 3½ lbs. sq. ft.	9 25	14 00
Sheets, 4 to 6 lbs. sq. ft.	9 00	13 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

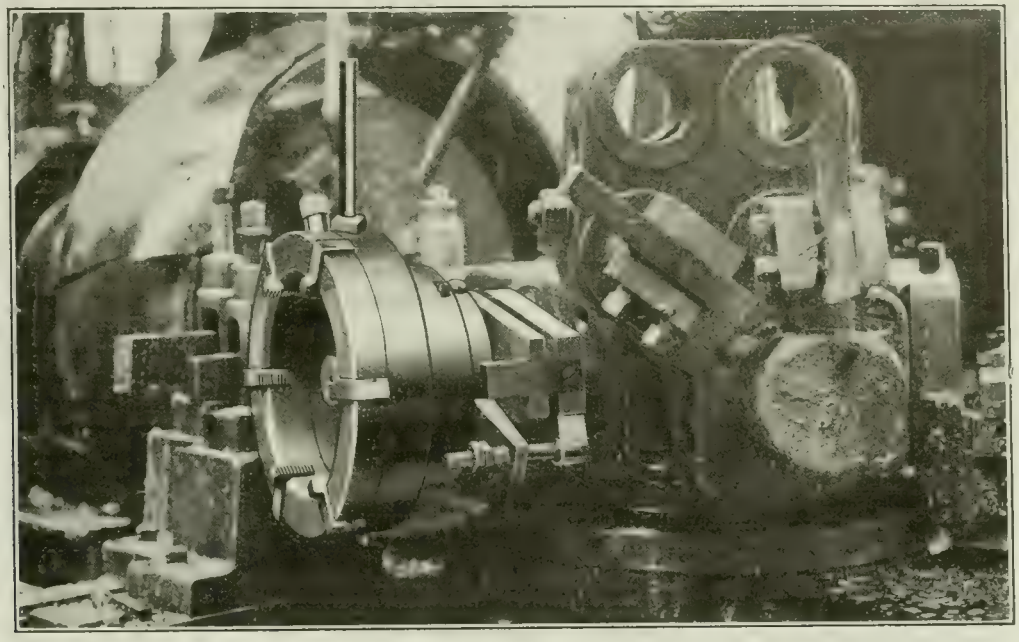
PLATING CHEMICALS

Acid, boracic	$ .25
Acid, hydrochloric	.03¾
Acid, nitric	.10¼
Acid, sulphuric	.03¾
Ammonia, aqua	.20
Ammonium, carbonate	.23
Ammonium, chloride	.22
Ammonium, hydrosulphuret	.75
Ammonium sulphate	.30
Arsenic, white	.18
Copper, carbonate, annhy.	.35
Copper, sulphate	.10
Cobalt, sulphate	.20
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulphate	16½
Nickel carbonate	.30
Nickel sulphate	.17½
Potassium sulphide (substitute)	.40
Silver Chloride (per oz.)	1.15
Silver nitrate (per oz.)	1.10
Sodium bisulphate	.13
Sodium carbonate crystals	.04
Sodium cyanide, 127-130%	.39
Sodium hyposulphite per 100 lb.	6.50
Sodium phosphate	.15
Tin chloride	.80
Zinc chloride, C.P.	.30
Zinc sulphate	.08

Prices per lb. unless otherwise stated

Right in the Lead

A Big Job
And A Big Die Head To Cut The Thread



In less than one minute's time the big 5⅜-inch Geometric Die Head cuts the thread on the bearing plate of ball-bearing journal jacks, and then releases automatically and makes way for the next tool.

The Foreman of Tool Supply in that Shop says he knows of no other tool that will do the work as they require it done like a GEOMETRIC.

Geometric Screw-cutting Tools help the man at the Lathe and at the Screw Machine give the best possible showing on a day's work. These tools are built to fit the work —to handle it in the easiest manner and produce threads that are true in every particular.

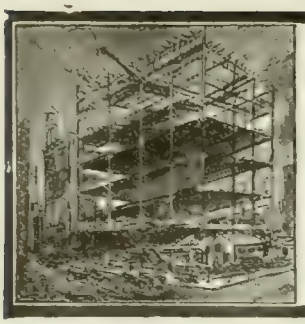
100 PER CENT. SATISFACTION
IS OBTAINED BY THE USE OF A GEOMETRIC.

THE GEOMETRIC TOOL COMPANY
NEW HAVEN CONNECTICUT

Canadian Agents:

Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta.
Williams & Wilson Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, St. John, N.B.; Halifax, N.S.

If interested tear out this page and place with letters to be answered.



INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES

EXPECT TO GET ENGLISH ORDER

Canadian Car Co. Officials Are Off To England To Secure Order For Canadian Shop

Montreal—Negotiations for a large order for railway equipment have practically been completed in England with W. W. Butler, of the Canadian Car and Foundry Co., and W. H. Woodin, of the American Car Company, who have sailed for England to close the contracts.

Canadian railways, although short of equipment, have not ordered any new equipment recently, and a substantial Government order, which the Canadian Car Company has been expecting, has not materialized. Every effort, therefore, is being made by the car officials to book export business.

Will Press Claim

Although little has been heard regarding the progress being made in connection with the company's claim for $6,000,000 of alien enemy money held by the United States Government to reimburse the company for the destruction of its Kingsland, N.J., shell plant during the war period, it is learned that the company is still pressing the claim and the consensus of opinion is that the verdict will be satisfactory.

Work of Spies

It will be recalled that when the United States entered the war, the Washington authorities seized many millions in cash and property from German-Americans, and decided to employ whatever part of this was necessary to reimburse allied concerns for damage as the result of plots by spies and German agents. When Canadian Car's New Jersey plant was destroyed with tremendous loss proof was forthcoming that the explosion was the work of spies employed by the Germans and on this evidence the company is basing its claim.

WHO WROTE IT?

On page 36, March 24th issue, we published a panel on cutting piston rings. This was credited to G. H. Unfortunately we lost the original name of the author. Will he kindly write us at once so that this matter can be straightened up?—Editor.

TRADE GOSSIP

A factory for the manufacture of tins will be built by the Laing Produce & Storage Co., Ltd., Brockville, Ont.

The Canada Overseas Trading Co., Vancouver, B.C., has secured an order for 8,000,000 feet of ties for the Egyptian State Railway.

The erection of a refrigerator building is contemplated by Trottier & Mainville, 1091 Dorchester Street East, Montreal.

J. B. Nicholson, Ltd., Toronto, have been awarded general contract for the reconstruction of coal yard for Milnes Coal Co., foot of Church Street, Toronto.

The general contract for construction of coal-handling plant for Bridgeburg Coal Co. is placed with J. B. Nicholson, Ltd., Excelsior Life Building, Toronto.

The Princess Hotel at the corner of King and Princess Streets, Toronto, has been purchased by the Florentine Statuary Co. and will be converted into a factory.

J. B. Nicholson, Ltd., Excelsior Life Building, Toronto, has been awarded the general contract for the construction of grain elevator and workhouse for the Dominion Flour Mills, Ltd., Brantford, Ont.

Tenders are being called for new Y.M.C.A. building at the corner of Queen and Weber Streets, Kitchener, Ont. Plans and specifications for all trades may be secured on application at Y.M.C.A.

The Sterling Woodworking & Construction Co., St. Lambert, Que., whose premises were destroyed by fire in November, 1920, have nearly completed rebuilding, and the factory is now in operation. Sashes, doors, interior finish and general millwork will be manufactured by this firm.

FIRES

Fire swept the business section of Capreol, causing a loss of $45,000 to $50,000.

The high school at Cayuga, Ont., was recently destroyed by fire. The loss is estimated at $30,000, with insurance of $10,000.

Fire destroyed the factory of the Johnson Rubber Goods Co. on Creighton Avenue, Mount Dennis, Ont. The loss is estimated at $15,000.

STEEL OF CANADA ANNUAL REPORT

Very Satisfactory Operations Were Carried On During the Year 1920

A satisfactory showing, despite the many adverse factors which prevailed during 1920, is made by the report of the Steel Company of Canada for that period which was made public. The exhibit shows gross profits well up to those of the 1919 level. After deducting charges for repairs, maintenance, improvements and making provision for inventory, reserve and 1920 income tax, the results of the twelve months' operations amounted to $3,924,041, as compared with $4,000,940 in 1919 and $5,367,120 in the preceding year.

From the 1920 gross figures were deducted an amount of $652,255 as a provision for excess costs of construction due to the abnormal conditions existing during the year, as well as an allowance of $712,683 for depreciation. These provisions, together with sinking fund requirements and fixed charges, left net earnings of $1,855,404, against $2,382,171 in 1919, the latter year's showing in this respect being enhanced by the fact that no allowance was made for the writing off of any allowance for excessive building costs.

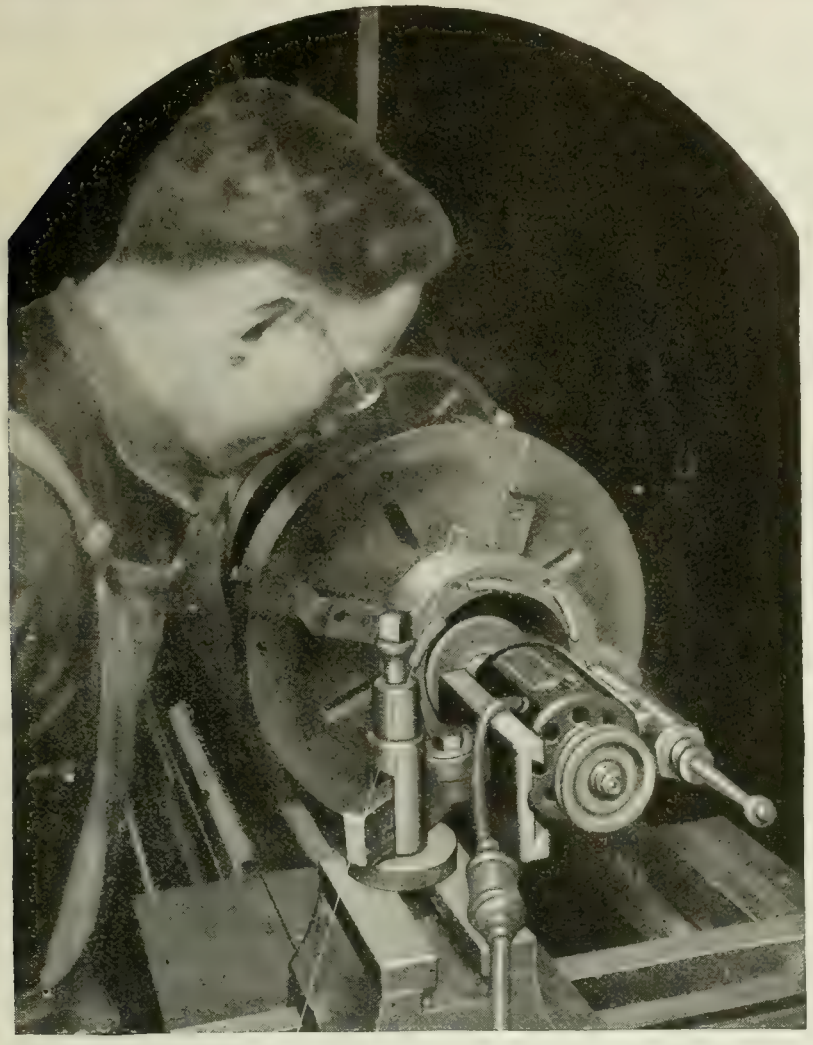
Earning Capacity of 11.7 Per Cent.

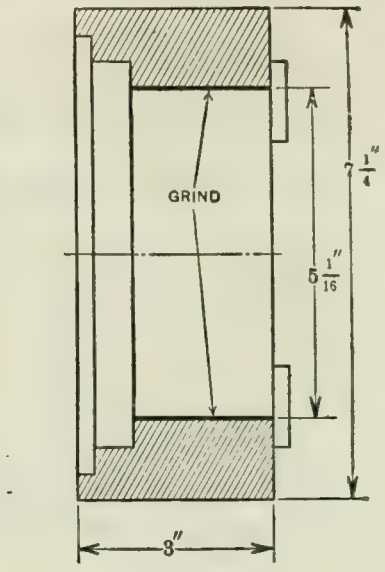
After the payment of dividends on the preferred stock of the company there was left available for application to the common shares a balance of $1,400,663, which, however, was reduced by $50,000 transferred to fire insurance reserve, leaving the net sum of $1,350,663, representing an earning capacity of 11.7 per cent. on the junior securities, compared with 14.6 per cent. in 1919, 15.8 per cent. in 1918 and 19.5 per cent. in 1917.

The Record Foundry & Machine Co., Moncton, B.C., was destroyed by fire on March 28. The damage to the warehouse and shops is set at $70,000, fully covered by insurance.

WANTS TO KNOW

A correspondent writes for information on the subject of flour grinding rolls Who can supply us with some information on this subject?





CAM
FOR DIE HEAD

Attached to the toolpost of the engine lathe on which this cam has been machined, the Dumore Grinder accurately grinds the hole without necessitating another "set up." The high efficiency standards of the Geometric Tool Co. (New Haven Conn.) make comment unnecessary on this method of handling the job. It is sufficient that the work of the Dumore is so satisfactory, the finish so fine, that all cams this size or larger, made in this shop are ground in this manner.

The Average Shop Has Constant Use for Dumore Grinders

Dumore Grinders are made in types and sizes that can be attached to all classes of machines and used to successfully perform a wide variety of grinding operations.

Equally valuable for the important "odd jobs" that must be done in every shop and on some manufacturing work, they find a ready place in every part of every metal working plant—whether toolroom, factory or repair shop.

Ask us about DUMORE Grinders—full details on request.

Wisconsin Electric Company

2933 Sixteenth Street **Racine, Wisconsin**

DUMORE HIGH SPEED GRINDERS

If interested tear out this page and place with letters to be answered.

TRADE GOSSIP

C. M. C. New Office.—Canada Machinery Corporation has moved its Toronto sales office from Brock Avenue subway to rooms 721-2, Bank of Hamilton Building, the new phone number being Main 745. W. J. Irving is in charge of the office, and J. W. Brown continues with the sales force here.

Bought Premises.—The British Canadian Tool and Machine Co., Ltd., Toronto, have purchased the property at 506 to 516 King Street East from the King Street Mission for $23,000. The lot has a frontage of 100 feet by a depth of 200 feet. This property was bought by the mission in 1912 with the idea of erecting a new building. The property is opposite the old car barns. The purchasers are erecting a $40,000 factory.

Two Cuts Coming?—It has been reported in New York that a cut by the United States Steel Corporation, in prices as well as wages, would be announced on the return of E. H. Gary from his western trip, probably on Thursday. The Steel Corporation officials admit that the matter has been under consideration, but that nothing will be made public until Mr. Gary's return.

Making Steel Sash.—Operations were commenced last week by Steel Sash, Ltd., London, makers of window sashes. This organization secured the Canadian patent rights from the American firm operating at Paterson, N.J. It is stated that total business in Canada for these products amounts to $2,000,000 annually, and the London plant expects to have a turnover of $200,000 in its first year. Three other plants make a similar line of products in Canada.

New Power Plant.—Parmenter and Bulloch, Ltd., Gananoque, Ont., are building a new power plant at a cost of $40,000. They have installed a Wickes boiler, 200 horse-power, also a Skinner engine, 150 horse-power (Unaflow type); Weber stack of reinforced concrete by the Weber Chimney Co., Chicago; Smith gas producer, 150 horse-power, by the Smith Engineering Co. This plant was designed and constructed under the supervision of W. Rees, M.E., who is also mechanical superintendent of Parmenter and Bulloch. J. S. McIntyre, who has been with Parmenter and Bulloch for the past fourteen years, is the operating engineer.

New Windsor Plant.—The new plant of the Toledo Scale Company at Windsor was opened recently, and the Canadian sales force is holding its convention coincident with the opening of the factory. The new building is of modern construction, with about 40,000 square feet of manufacturing space. The company proposes to do export business to other parts of the British Empire from its Canadian plant. An application has been made for a Dominion charter, and the name of the organization will be Canada Toledo Scale Company, Limited.

Want Tenders—The Canadian National Railways, eastern lines, are calling for tenders for the construction of eight concrete structures. W. A. Kingsland, C. N. R., Montreal, is receiving tenders and particulars can be had from the office of the engineer maintenance of way.

Conditions Better.—The Ontario Steel Products Co., of Gananoque, find that business has improved very appreciably during the past month. David Bain, who is general manager, when speaking to Canadian Machinery, stated that he is very optimistic about the business outlook as a whole, and looks for a general improvement in the very near future.

SCOTIA STEEL HAVE ANNUAL MEETING

Feeling Seems To Be That Worst Has Passed, and Future Is Faced Confidently

New Glasgow.—The annual general meeting of the shareholders of the Nova Scotia Steel & Coal Company was held at the offices of the company in New Glasgow on March 30, at which the annual report of the company for the year 1920 was read and unanimously adopted. The president and management were congratulated by a number of the shareholders present on the excellent showing made during the past year, in the face of the none too promising prospects at the time of the previous meeting of the shareholders held in March, 1920, and all of those who spoke expressed the hope that although there was at present a world-wide trade depression, the worst had passed, and that the future might be looked forward to with confidence.

PRICES BEING CUT IN CHICAGO

Warehouses Are Out in an Effort to Get the Buyers to Come in and Take Hold

Price reductions are announced by leading steel warehouse interests in Chicago on practically all grades of stock. Union Station Co. has placed the order for 7,000 tons of structural steel for the new railway mail postoffice with the McClintic-Marshall Co., of Pittsburgh. Price is understood to be slightly under $74 a ton comparing with $95 to $105, the prevailing level six months ago, and the pre-war range of $50 to $55.

The cut was made in the first place because auto interests and others were showing no tendency to come into the market.

About $15,000 damage was done to the New Toronto Leather Works in the recent fire. The loss is practically covered by insurance.

RAILWAY SHOPS LET WORK SLIDE

Claim Costs Are Too Great Too Keep The Rolling Stock In Proper Repair

CHICAGO. — With their revenues so diminished that they are unable to earn operating expenses, the railroads have undertaken drastic measures of retrenchment. Blocked in their efforts to reduce wages and to change working conditions, the carriers have had but one course left to them, namely, the curtailment of their working forces. Wherever an employee can be dispensed with without actually interfering with the operation of trains, he is being laid off.

Railroad shops are fast being closed. Within the past few days the Delaware & Hudson has discontinued operations in its Colonies shops near Albany, N.Y., and this action will soon be followed by the closing of the Green Island, N.Y., and Oneonta shops of the same road.

The New York Central shops at West Albany have been shut down. These instances are typical of what is happening all over the country. As a result, necessary maintenance and repair work is being postponed indefinitely. It is estimated on good authority that ten per cent. of the entire freight equipment of American railroads is now in bad order, and this proportion is steadily being increased. When a car gets in bad repair, the railroad switches it on a siding, where it will remain until reduction in labor costs justifies its renovation.

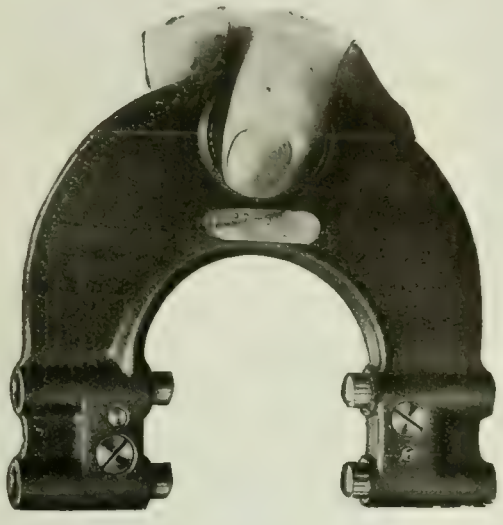
ALLOWANCES FOR RUNNING AND FORCE FITS

RUNNING FITS		FORCE FITS	
Diam. of Bearing	Diam. of Shaft	Diam of Hole	Diam. of Shaft
1	.999	1	1.001
2	1.998	2	2.003
3	2.997	3	3.005
4	3.9965	4	4.006
5	4.9963	5	5.007
6	5.996	6	6.008
7	6.9958	7	7.0085
8	7.9958	8	8.009
9	8.9957	9	9.01
10	9.9956	10	10.0105
11	10.9955	11	11.011
12	11.9954	12	12.0115
13	12.9953	13	13.012
14	13.9952	14	14.013
15	14.9951	15	15.014
16	15.995	16	16.0145
17	16.9949	17	17.015
18	17.9948	18	18.0155
19	18.9947	19	19.016
20	19.9945	20	20.017

Allowances for Drive Fits are one-half that of Force Fits.

Aikenhead's Canada's Leading Tool Supply House

We are at all times able to fill your orders promptly—be they large or small. Our large stocks enable us to supply "Everything in Tools." When you require tools—think of Aikenhead's.



Johansson

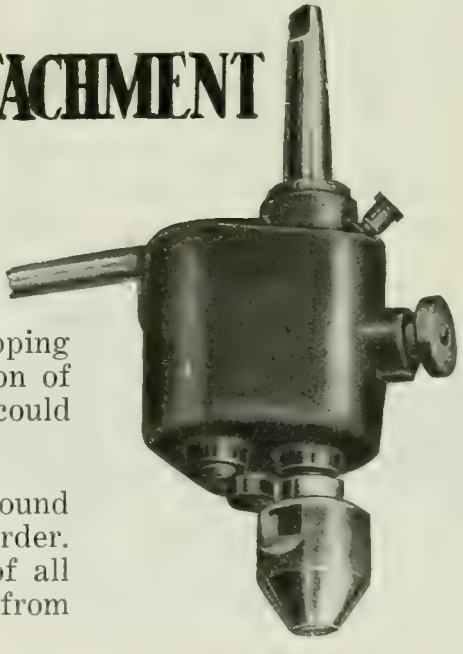
The World's Standard of Accurate Gauging

Introduce the "Limit System" into your shop with a set of Johansson Gauges. They assure equal results on all work, even in the hands of unskilled operators. They cut the time required for gauging in half—no inconsiderable item in these days of high production costs.

The Johansson book tells all about Johansson Gauges. If you haven't a copy, write to Aikenhead's for one to-day.

Wahlstrom's Tapping Attachment

Ten Times as Fast



Why stick to the old slow and expensive practice of hand tapping when you can do the same work in one-tenth the time with a Wahlstrom Automatic Tapping Attachment? It imitates the simple to-and-fro motion of hand tapping and will tap holes as squarely as they could be drilled.

The Wahlstrom is constructed of hardened and ground parts and has nothing whatever that can get out of order. It is manufactured in two sizes. No. 1 takes taps of all sizes from 5-40 to ½-inch standard. No. 2 takes taps from ¼ to ¾ inch.

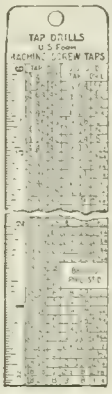
Aikenhead Hardware, Limited

17 Temperance Street, Toronto, Ont.

If interested tear out this page and place with letters to be answered.

Have You Tried This Contest Yet? If not--- Do so Now

Below will be found twelve references to advertisements in this number. To the sender of the first correct set of answers to these we will forward one of these scales.
To win one is not difficult, and at the same time you will add to your store of knowledge. Read the details given below.



The scale is 6 in. long and is made from finest quality steel. One side is marked in 32nds, the other side in 64ths. A table of decimal equivalents is also stamped on one side, and a table of tap drill sizes on the reverse side. This scale is well worth securing.

What You Have to Do

We publish every week a number of interesting facts or statements selected from the advertising pages for that week. The selections for this issue are given below. Read these through, then turn to the advertising section and see if you can pick out the advertisements to which they refer. The work is interesting, it will train your powers of perception and of memory, it costs you nothing, it will make you better acquainted with the various lines of machinery and tools in the market, and with perseverance you are bound to win one of these useful scales as a prize.

Eleven contestants sent in correct lists to the March 17th contest. We had again to resort to the elimination process, and Macklin Cunningham, Litchfield Conn., U.S.A., was the lucky one. This method of picking the winner is fair to everyone, for it does away with the distance problem. No matter how far away a subscriber lives, he has three weeks from the date of issue to send in his copy. On another page will be found the names of the other ten readers who forwarded correct lists.

CONTEST FOR APRIL 7 ISSUE

Contestants are required to write us, stating to which advertisements we refer in this number.

1 A case where brute strength pays.
2 How to get away from paying exchange.
3 A case where back draft is impossible.
4 How to protect your staff against disorganization.
5 How to ensure speed and easy manipulation
6 A case where steers are very useful.
7 How to reap dividends quickly.
8 Something that contains no holes at the top or sides.
9 A product said to take the place of reamers
10 Something that is always at your service.
11 A job that's done in less than a minute
12 Something that is fully guaranteed.

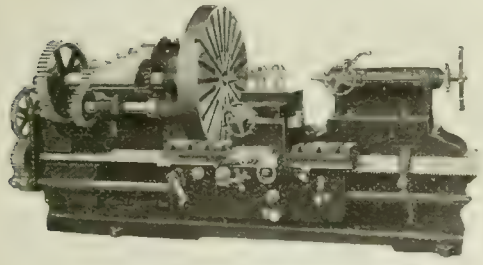
These are Correct Answers for List from March 17th Issue:

1—Roelofson Machine Tool Co. Ltd.
2—Kearney and Trecker Co.
3—Northern Electric Co. Ltd.
4—Ford-Smith Machine Co. Ltd.
5—C. E. Johansson, Inc.
6—The Toledo Machine & Tool Co.
7—The Holden Co. Ltd.
8—J. H. Williams & Co., Ltd.
9—E. C. Atkins & Co.
10—W. S. Rockwell Co.
11—J. Ackworthie, Ltd.
12—Independent Pneumatic Tool Co.

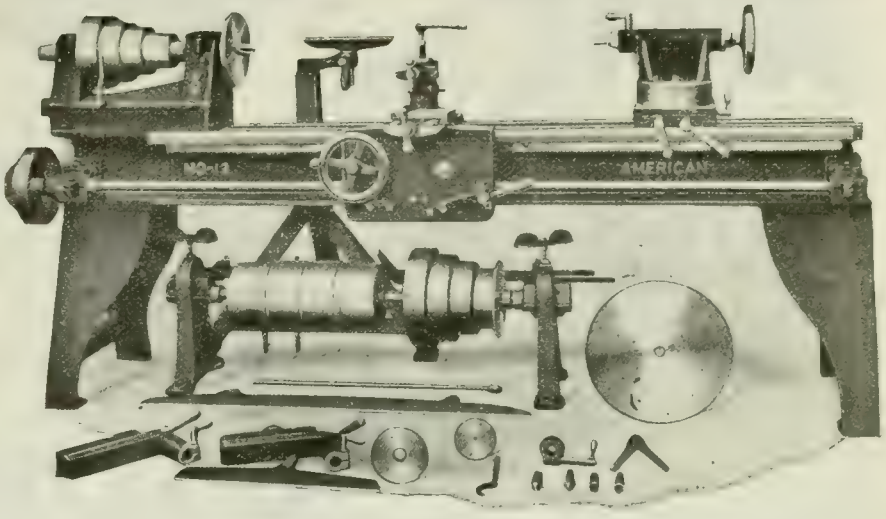
Closing Date for This Contest is April 28th.

GARLOCK-WALKER MACHINERY CO. LIMITED

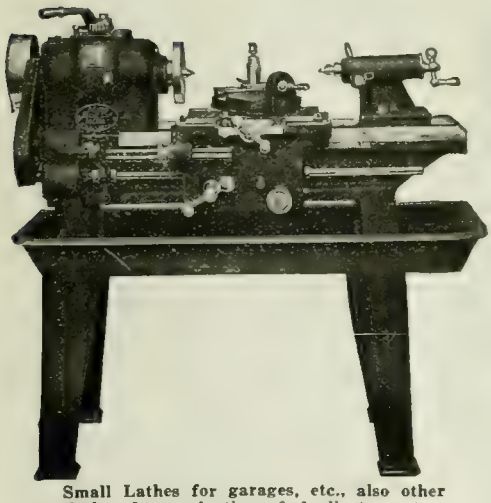
32 FRONT ST. WEST. **TORONTO** TELEPHONE MAIN 5346



Heavy Duty Engine Lathes, 36" to 54" swing, in stock.



A Lathe with various attachments for the pattern shop.



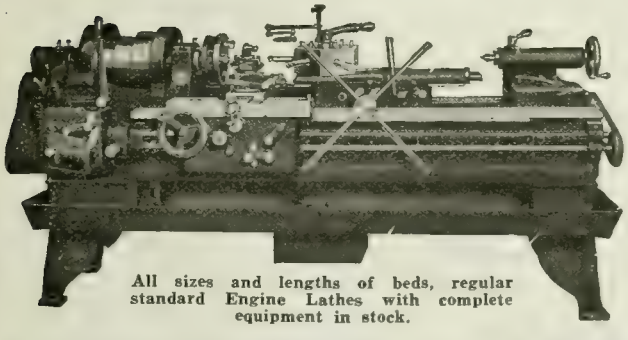
Small Lathes for garages, etc., also other lathes for production of duplicate parts.

New and Used Lathes

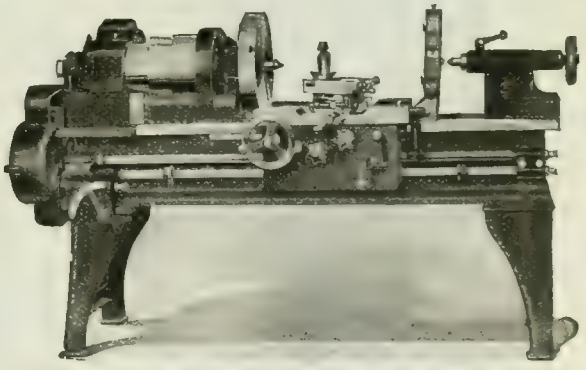
Good Opportunities

DO you want to secure a lathe or other machine tool at a very attractive price? Get in touch with us now. We have an immense stock of **new** and **used** tools in our Toronto warehouse which you can secure at a price which will be bound to interest you. We have the lathe you want, the planer, the grinder, or other tool you want—Buy now.

Quotations supplied on Equipment for any plant.



All sizes and lengths of beds, regular standard Engine Lathes with complete equipment in stock.



Manufacturing Lathes with Turret equipment for heavy duty and production operations in stock.

Garlock-Walker Machinery Company, Limited

32 Front Street West

MONTREAL TORONTO WINNIPEG

METAL and WOODWORKING MACHINERY of all Kinds

If interested tear out this page and place with letters to be answered.

A Drinking Water Service that will last a LIFETIME

What you pay for a [illegible] drinking [illegible] its will meet the [illegible]

PURO SANITARY DRINKING FOUNTAIN

(MADE IN CANADA)

DRINKING CUPS ARE UNSANITARY [illegible] "Puro" delivers cool, [illegible] [illegible] of [illegible] [illegible] bill.

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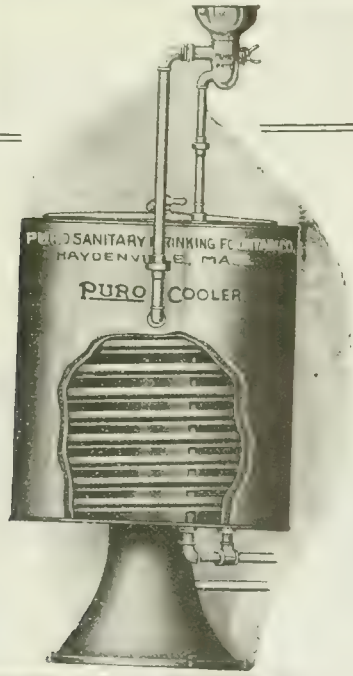

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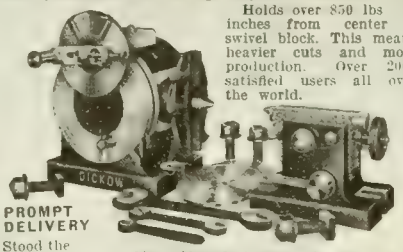

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WHEN WRITING TO ADVERTISERS KINDLY MENTION THIS PAPER

MONTREAL NOTES

The Oliver Engineering Co. are removing their Montreal offices and show rooms from 296 St. James Street to 307 St. James Street. This firm has recently installed some large hand operated cranes in the new power plant of the Montreal Harbor Commissioners and also in the plant of the Anglo-Canadian Wire Rope Co.

A large portion of the plant of the Record Foundry and Machine Co., at Moncton, N.B., was destroyed by fire last week; the damaged section is that of the warehouse and machine shop. Considerable stock was carried in the warehouse at the time of the fire. The loss was fully covered by insurance. Reconstruction work will be commenced immediately.

A. J. Hopkins, of 392 St. James Street, Montreal, has secured the Canadian agency for the Red Devil dolly jacks, and arrangements have been made for the manufacture of this line in Canada. Mr. Hopkins has likewise obtained the agency for the Billmont tools manufactured by the Edgar C. Guthard Co., of Chicago. This is a line of interchangeable sockets and wrenches.

The Corundo Steel Co., Ltd., have acquired the old Record Foundry and Machine plant at 17 Mill Street, Montreal. The purpose of the company is to establish a factory for manufacturing cutting and percussion tools from low-grade steel and by a special chemical heat treating process convert it into a product equal in quality to high-grade tempered steel, suitable for a variety of conditions. Oscar Schenk is managing director.

W. J. O'Leary, electrical engineer, of Montreal, has developed a new type of electrical motor, based on the utilization of harmonic vibrations for the source of power. The weight of the rotor is about one-sixth that in an ordinary motor of the same horsepower, and it is stated that a saving of from 20 to 50 per cent. is effected in current used. The invention has been patented in twenty-six different countries, and it is claimed that it can be applied to any machine requiring power for its operation.

An incorporated company to be known as the Prince Edward Island Light, Heat and Power Co. has recently been formed to supply light, heat and power by the use of electricity to all parts of Prince Edward Island, from one large central power station, using coal for generating purposes. It is expected that permanent employment will be provided for about 200 men. Noah A. Timmins, multi-millionaire, and W. J. O'Leary, electrical engineer, both of Montreal, are interested in the company.

The Black and Decker Manufacturing Co., of Baltimore, Md., are opening a new Canadian plant and sales office in Montreal. A. J. Hopkins, who for some

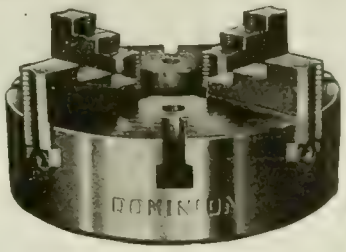
time past has been connected with this firm, will assume the management of the Canadian business. Mr. Hopkins has been associated with the machine tool trade for a number of years. The Montreal offices will be located at 392 St. James Street.

E. McG. Quirk, of the Federal Labor Department, is now in Cape Breton district on behalf of the Dominion Government for the purpose of investigating conditions relating to the steel industry. The primary reason for this move is the request of the steel workers for a federal inquiry into the situation existing in that section, particularly in connection with the recent wage reductions made by the steel companies.

The Department of Marine and Fisheries announce that the laying of the 500 buoys in the St. Lawrence, between Montreal and Quebec, will be commenced this week; the completion of this work marks the official opening of the river for ocean vessels. While it is expected that cargo vessels now in route may be diverted from their usual winter destination, owing to the earlier opening of inland navigation, it is not anticipated that any great change will be effected in passenger traffic, as it would be inadvisable to interfere with the prepared schedule.

Canadian Vickers, Ltd., have announced that the first launching of the season will take place on Saturday of this week, when the Norwegian cargo steamer "Idefjord," constructed for the shipping firm of Den Norske Amerikalinje, of Christiania, Norway. Another vessel for Norwegian register will be launched from this yard in the course of the next few weeks. Two Canadian Merchant Marine freighters, launched last fall, will shortly be turned over to the owners. The outlook for future building at this yard has been clouded by the prevailing high costs of construction work and the keen competition from yards in other countries.

With the passing of winter construction work has again started on the large cold storage plant being erected at the port of Montreal by the Harbor Commissioners. It is expected that the structure will be sufficiently advanced this summer to enable the lower floor and basement to be used for the handling of perishable goods before the closing of the 1921 season. Work on the power house for operating the refrigerating equipment, and the transforming of power for use on the electrified railroads of the port, has proceeded throughout the winter, and this will be ready for operation in a very short time. An immediate start is to be made on continuing the work of electrifying the remainder of the harbor service, and it is hoped that this will be finished by fall.



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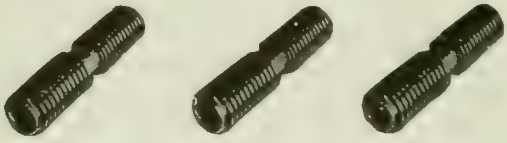

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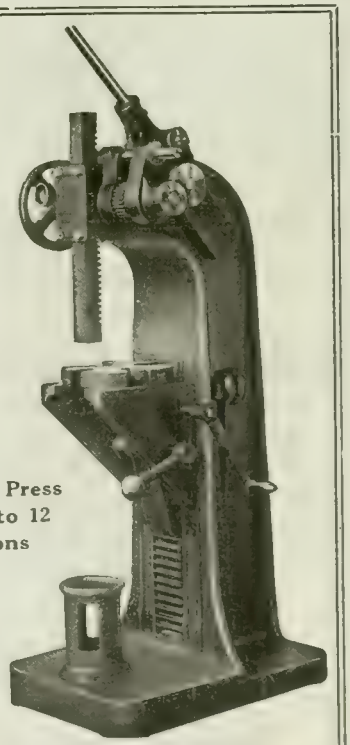

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Advertisements for this section must be in our composing room Tuesday morning prior to day of issue.

In order that the announcements of your wants, machinery for sale, etc., etc., shall not be delayed, please try to have them in our office with the Tuesday morning mail.

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Let our Battery of Bullards do it

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1—24" x 12' Canada Machinery Lathe.
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6—20" x 8' C.M.C. Lathes.
1—18" x 8' Mueller Lathe.
1—18" x 8' London Lathe.
3—18" x 8' C.M.C. Lathes.
1—16" x 6' McDougall Lathe.
1—14" x 8' London Lathe.
1—14" x 6' Flather Lathe.
2—No. 1 Racine Hack Saws.
4—20" McDougall Drills.
1—22" Barnes Drill.
1—28" Barnes Drill.
1—D-1 H.D. Colburn Drill.
2—No. 24 H.D. Foote-Burt Drills.
1—16" C.M.C. Shaper.
1—24" Rockford Shaper.
2—2" x 26" Pratt & Whitney Turrets.
1—10" x 52" Plain Landis Grinder.

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6—Herault Electric Furnaces, 6 ton, tilting type, complete with transformers and auto regulators.

18—Williams Cut Off Machines, hollow spindle, taking up to 9½" bar stock.

1—Ajax Bulldozer, No. 12, jaw opening, 54" x 72" deep, approximately 12" stroke, sliding head.

6—Deane Horizontal, double plunger Pumps, 4⅛" x 18", capacity 200 gallons at 1,500 lbs. working pressure, being motor driven and complete with motors.

4—Kennedy Billet Shears, double head, 14" capacity.

1—Combined Punch and Shear, 10" throat.

8—New, Pittsburgh Ladles, cast steel, bottom discharge, 15 ton.

4—Used, Pittsburgh Ladles, cast steel, bottom discharge, 12 ton.

5—Used, Steel Plate Ladles, bottom discharge, 9 ton.

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1—18" x 8' Greaves Klausman, 3 step cone, D.B.G., Q.C.G.
1 17" x 8' Sidney, 3 step cone, D.B.G., Q.C.G.
1—16" x 6' Rahn Larmon, 3 step cone, S.B.G., Q.C.G.
1—14" x 6' Screw Cutting Engine Lathe, 3 step cone, S.B.G., compound rest complete with chuck.
2½ x 24 Jones & Lamson, complete with collets and regular equipment.
3 x 26 Jones & Lamson, complete with collets and regular equipment.

MISCELLANEOUS

1—No. 9B Hendey Whitmore, Double End Punch and Shear, ⅝ in ⅝.
1 No. 4 Greenard Arbor Press, complete.
1—24" McGregor Gourley Shaper, B.G., power traverse.
1—No. 3 Ballantyne Self-feed Saw Table, 12" saw.
1 No. 1 Ballantyne Pedestal Shaper, 22" between spindles, complete.
1—16" Harper Jointer, square cylinder gauges, complete.
1—26" Harper Planer, complete with counter shaft.
1—8" Four-sided Cowan Moulder.
1—Cowan Horizontal Shaper.
2 Cowan Boring Machines, upright, foot treadle.
1—Cowan Disc Sander, wooden frame.
1—No. 2 Sutton Double End Punch and Shear, S.G., 8" throat, 4½" shear blade with 8" throat and ½" punch.
1—20" Barnes Drill, plain wheel and lever feed, round table and base.
1 Ball Bearing Emery Wheel, pedestal type, 36" spindle, complete.
1—Perrin Hydraulic Press, ram 8" diameter, tight and loose pulley.
1—Air Compressor with two tanks.
1—66" x 14' boiler, complete with fire front grate and fittings.
1—New London Concrete Mixer, mounted on truck with engine and boiler.
1 10 x 24 Landis Grinder, complete with standard equipment.

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2—40 H.P. Ideal Electric Company Motors, 3 phase, 60 cycle, 550 volt, 39 amp., type A-22, mounted on base and direct connected to:

25 K.W. Battery-Charging D.C. Generators, type HR-22, 92 volts, 272 amps., 865 R.P.M. and with one 6 Circuit Switchboard, circuit breaker Field Rheostat.

1—45 H.P. Allis-Chalmers Motor, 3 phase, 60 cycle, 550 volts, 1160 R.P.M., 42 amps., mounted on base. Direct connected to:

Allis-Chalmers D.C. Generator, 125 volts, 420 amp., 1160 R.P.M., interpoles, 4 bearings.

3—14.3 H.P. Westinghouse Motor, 3 phase, 60 cycle, 550 volts, 1750 R.P.M.
Direct connected to:

9 K.W., type SK, 72 amp., 1750 R.P.M., 125 volt, A.C. shunt wound Generator.

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Precision Machinery

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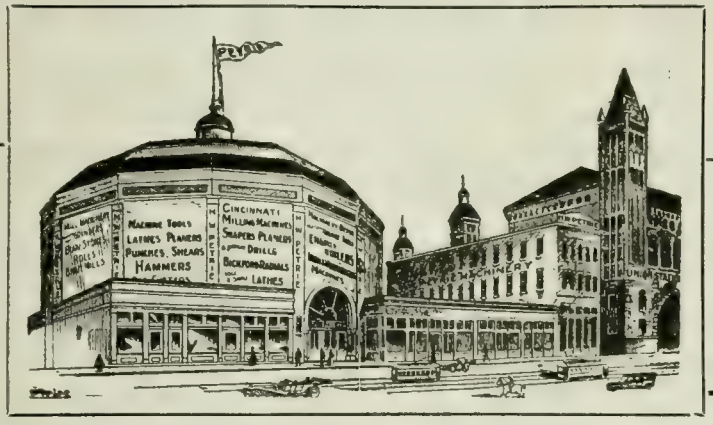

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Bertram Double-end Punch and Shear, 42″ throat; will punch 1½″ in 1⅛″ plate, and shear 8″ x 1″ flat.

Edwards Double-end Punch and Shear; punch 38″ throat, capacity 2″ in 1″ plate, shear 30″ throat, with splitting blades 18″ long; angle shear in centre of frame for 6″ x 6″ angles.

Cleveland Style "C" Single-end Punch, 24″ throat; will punch 1″ in ½″ plate; architectural jaw.

Bertram Double-angle Shear, will cut 6″ x 6″ angles.

Bertram Horizontal Punch, capacity 1″ in 1″ plate, $16\frac{1}{2}$″ gap.

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Five-ton **Wilson** Revolving Locomotive Crane, standard gauge, 25-ft. boom, engine 7″ x 10″ double cylinder, truck frame 9′ 6″ x 6′ 6″ on four wheels.

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TORONTO and HAMILTON

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Axles, Car
Dom. Foundries & Steel, Hamilton, Ont.

Babbitt Metal
Atkins & Co., Inc., E. C., Indianapolis, I.
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.

Balls, Brass, Bronze and Steel
Canada Foundries & Forgings Co., Welland, Ont.
Canadian SKF Co., Toronto, Ont.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Railway Roller Bearing Co., Syracuse, N.Y.

Barrels, Tumbling
Baird Machine Co., Bridgeport, Conn.
McDougall Co., Ltd., R., Galt, Ont.

Bars, Boring
Armstrong Bros. Tool Co., Chicago, Ill.
Bertram & Son Co., Ltd., The John, Dundas, Ont
Gisholt Machine Co., Madison, Wis.
Madison Mfg. Co., Muskegon, Mich.

Bars, Boring, Portable
Underwood Corp., H. B., Philadelphia, Pa.

Bars, Bronze Cored
Moore & Son, Thos., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.

Bars, Iron
Steel Co. of Canada, Ltd., Hamilton, Ont.

Bars, Steel
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Ontario Metal Products Co., Ltd., Toronto, Ont
Pilot Steel & Tool Co., Montreal, Que.
Steel Co. of Canada, Ltd., Hamilton, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.

Bearings, Ball
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Lang Mfg. Co., Guelph, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Railway Roller Bearing Co., Syracuse, N.Y.

Bearings, Bronze
Tallman Brass & Metal Co., Hamilton, Ont.
Railway Roller Bearing Co., Syracuse, N.Y.

Bearings, Die-Cast
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Tallman Brass & Metal Co., Hamilton, Ont.

Bearings, Journal
Fisher Motor Co., Ltd., Orillia, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

Bearings, Roller
Can. Fairbanks-Morse Co., Ltd., Montreal.
Lang Mfg. Co., Guelph, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Railway Roller Bearing Co., Syracuse, N.Y.

Belt Cement
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que

Belt Clamps
Graton & Knight Mfg Co., Worcester, Mass.

Belt Dressings and Fillers
Aikenhead Hardware Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.

Belt Fasteners
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

Belt Lacing
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.

Belt Lacing, Steel
Flexible Steel Lacing Co., Chicago, Ill.

Belt Lacing, Hinged
Flexible Steel Lacing Co., Chicago, Ill.

Belt Lacing, Flexible Steel
Flexible Steel Lacing Co., Chicago, Ill

Belt Lacing Machines
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
McLaren Belting Co., J. C., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

Belt Joiners, Conveyor
Flexible Steel Lacing Co., Chicago, Ill.

Belt Tools
Graton & Knight Mfg. Co., Worcester, Mass.

Belting, Chain
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

Belting, Fabric
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
McLaren Belting Co., J. C., Montreal, Que.
Sumner & Co., New York City

Belting, Leather
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Smith Belting Co., Toronto, Ont.
Sumner & Co., New York City.
Tullis & Son, Ltd., John, Glasgow, Scot.

Belting, Rubber
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Gutta Percha & Rubber, Toronto, Ont.
Quaker City Rubber Co., Philadelphia, Pa.

Belts, Abrasive
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Oakey & Sons, Ltd., John, London, S.E., Eng.

Bench Countershaft Standards
Ford-Smith Machine Co., Hamilton, Ont.

Benches, Work
Aikenhead Hardware Ltd., Toronto, Ont.

Bending Machines, Power
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bertrams Ltd., Edinburgh, Scotland.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

Bins, Ore
MacKinnon Steel Co., Sherbrooke, Que.

Blocks
Ford Chain Block Co., Philadelphia, Pa.
Wright Mfg. Co., Lisbon, Ohio.

Blocks, Chain (See Hoists, Hand)
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Ford Chain Block Co., Philadelphia, Pa.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

Blocks, Die
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.

Blocks, Pillow
Can. Link-Belt Co., Toronto, Ont.

Blowers
Can. Blower & Forge Co., Ltd., Kitchener.
General Combustion Co. of Can., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

Bolt and Nut Machinery
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Victor Tool Co., Waynesboro, Pa.

Bolt and Nut Machinery, Automatic
National Acme Co., Cleveland, Ohio.

Bolts and Nuts
London Bolt & Hinge Works, London, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Petrie, Ltd., H. W., Toronto, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

Bolt Threading Die Heads
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa

Boosters
Sturtevant Co., B. F., Boston, Mass.

Boring and Turning Mills, Vertical
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.

Boring, Drilling and Milling Machines, Horizontal
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Landis Tool Co., Waynesboro, Pa.

Boring, Drilling and Milling Mach., Vertical
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

Boring Heads
Aikenhead Hardware Ltd., Toronto, Ont.

Boring Tools
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Gisholt Machine Co., Madison, Wis.

Brakes, Magnetic (for electric furnaces)
Volta Mfg. Co., Welland, Ont.

Brass
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

Bricks, Fire
Elk Firebrick Co. of Can., Ltd., Hamilton, Ont.

Bridges
Hamilton Bridge Works Co., Ltd., Hamilton, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

Broaching Machines
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont

Bronze
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

Bronze, Phosphor
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont
Ontario Metal Products Co., Ltd., Toronto, Ont.

Bucket Carriers, Pivoted
Can. Link-Belt Co., Toronto, Ont

Buffing or Polishing Machines (See Polishing and Buffing Machines)
Blount Co., J. G., Everett, Mass.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
U.S. Electrical Tool Co., Cincinnati, O.

Bulldozers
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

Burners, Oil and Gas
General Combustion Co. of Can., Ltd., Montreal, Que.
Rockwell Co., W. S., New York City.

Bushings
Fisher Motor Co., Ltd., Orillia, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

Cabinets, Oil
S. F. Bowser & Co., Ltd., Toronto, Ont.

Calipers
Brown & Sharpe Mfg. Co., Providence, R.I
Starrett Co., L. S., Athol, Mass.

Cams
Canada Foundries & Forgings Co., Welland, Ont.

Can-Making Machinery (See Sheet Metal Working Machinery
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

BUYERS' DIRECTORY

Union Carbide Co. of Can., Ltd., Welland, Ont.

Cars, Ore
MacKinnon Steel Co., Sherbrooke, Que.

Castings, Aluminum
Canada Electric Castings Co., Ltd., Orillia.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

Castings, Brass and Bronze
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Canada Electric Castings Co., Ltd., Orillia.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Electric Steel & Engineering Co., Welland, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

Castings, Copper
Can. Hanson & Van Winkle Co., Toronto, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Castings, Marine
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Castings, Die Molded
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Katie Foundry Co., Galt, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Castings, Ferro-Alloy
Can. Steel Foundries, Montreal, Que.

Castings, Iron
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Bernard Industrial Co., A., Fortierville, Que.
Bilton Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Electric Castings Co., Ltd., Orillia.
Hanna & Co., M. A., Cleveland, Ohio.
Hepburn Ltd., John T., Toronto, Ont.
Katie Foundry Co., Galt, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Castings, Hyd. Press
Can. Steel Foundries, Montreal, Que.

Castings, Monel Metal
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

Castings, Naval Bronze
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Castings, Nichrome
Can. Driver-Harris Co., Walkerville, Ont.

Castings, Nickel
Can. Hanson & Van Winkle Co., Toronto, Ont.

Castings, Semi-Steel
Davidson Mfg. Co., Thos., Montreal, Que.
Hull Iron & Steel Foundries, Hull, Que.
Katie Foundry Co., Galt, Ont.
Manitoba Steel Foundries, Ltd., Winnipeg, Man.

Castings, Steel
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Can. Steel Foundries, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
Swedish Crucible Steel Co. of Can., Ltd., Windsor, Ont.

Cements, Iron
Smooth Mfg. Co., Jersey City, N.J.

Centering Machines
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

Chains (See Sprockets and Chains)
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

Chains, Driving
Can. Link-Belt Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

Chasers
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Chemists
Toronto Testing Laboratory, Toronto, Ont.

Chucking Machines
Acme Machine Tool Co., Cincinnati, Ohio
Brown & Sharpe Mfg. Co., Providence, R I
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

Chucks, Drill
Jacobs Mfg. Co., Hartford, Conn.

Chucks, Drill and Tap
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Canadian SKF Co., Toronto, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

Chucks, Lathe
Aikenhead Hardware Ltd., Toronto, Ont.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn
Dom. Steel Products Co., Brantford, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que
Geometric Tool Co., New Haven, Conn.
Gisholt Machine Co., Madison, Wis.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

Chucks, Magnetic
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Chucks, Planer
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

Chucks, Vertical Boring Mill
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

Clamps, Machinists'
Columbia Hdwe. Division, Cleveland, O.
Dickow, Fred C., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

Cleaners, Metal, Waste, General
Oakley Chemical Co., New York, N.Y.

Clocks, Time
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

Clutches, Friction
Bernard Industrial Co., A., Fortierville, Que
Can. Link-Belt Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Toronto, Ont.

Coal and Ash Handling Machinery
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

Coal-Storage Systems
Can. Link-Belt Co., Toronto, Ont.

Collars, Shaft or Set
Canada Foundries & Forgings Co., Welland, Ont.
Can. Link-Belt Co., Toronto, Ont.

Collets
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Compounds, Carburizing, Case Hardening and Tempering
Cataract Refining Co., Toronto, Ont.

Compounds, Cleaning
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

Compounds, Cutting, Drilling, Grinding, Screw Cutting
Atkins & Co., Inc., E. C., Indianapolis, I.
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

Compressors, Air
Curtis Pneumatic Machinery Co., St Louis, Mo

Compressors, Air and Gas
Can. Fairbanks-Morse Co., Ltd., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

Cones, Friction
Norton Co. of Can., Ltd., Hamilton, Ont.

Connecting Rods and Straps
Canada Foundries & Forgings Co., Welland, Ont.

Contract Work
Ford-Smith Machine Co., Hamilton, Ont.
Skinner Bros. Mfg. Co., Inc., St Louis, Mo
Victoria Foundry Co., Ltd., Ottawa, Ont.

Conveyors and Elevators (See Elevators)
Jones & Glassco, Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

Conveyor Belt Joiners
Flexible Steel Lacing Co., Chicago, Ill.

Copper
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

Cored Bronze Bars
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Cotter Pins
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

Counterbores
Cleveland Twist Drill Co., Cleveland, O.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Counters, Revolution
Aikenhead Hardware Ltd., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

Countershafts
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.

Countersinks
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Couplers, Car and Locomotive
Can. Steel Foundries, Montreal, Que.

Couplings, Flexible
Holden Co., Ltd., Montreal, Que.

Couplings, Rigid
Bernard Industrial Co., A., Fortierville, Que

Couplings, Shaft
Bilton Machine Co., Bridgeport, Conn.
Can. Link-Belt Co., Toronto, Ont.

Cranes, Electric
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.

Cranes, Hand (See Hoists, Hand)
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont
Sheffield Engineering Supplies, Ltd., Montreal, Que.

Cranes, Locomotive
Can. Link-Belt Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

Cranes, Traveling
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

Crank Pin Turning Machines
Garlock-Walker Mchy. Co., Toronto, Ont
Herbert Ltd., Alfred, Toronto, Ont
Underwood Corp., H. B., Philadelphia, Pa.

Cutters, Flue
Holden Co., Ltd., Montreal, Que.

Cutters, Gear
Armstrong-Whitworth Co. of Can., Ltd., Montreal, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Cutters, High Speed
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I
Bilton Machine Co., Bridgeport, Conn.
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Madison Mfg. Co., Muskegon, Mich.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Cutters, Milling
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Milling Machine Co., Cleveland.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.

Cutters, Stay Bolt
Acme Machinery Co., Cleveland, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Cutters, Thread
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.

Cutting-Off Machines
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

Cutting-Off Machines, Pipe (See Pipe-Cutting and Threading Machines)
Landis Machine Co., Inc., Waynesboro, Pa.
McDougall Co., Ltd., R., Galt, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

Cutting-Off Tools
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Pilot Steel & Tool Co., Montreal, Que.

Cutting Oil Filters (See Oil Filtering Systems)
Bowser, S. F., & Co., Ltd., Toronto, Can.
Cataract Refining Co., Toronto, Ont.

Cutting, Oxy-Acetylene
Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont.

Cutting, Oxy-Hydrogen
National Electro Products, Ltd., Toronto, Ont.

Dealers, Machinery (See Searchlight Section)
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

Deckle Straps
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Diamonds, Black and Rough
Joyce-Koebel Co., Inc., New York, N.Y.

Diamond, Carbon and Bortz
Joyce-Koebel Co., Inc., New York, N.Y.

Diamond Tools
Aikenhead Hardware Ltd., Toronto, Ont
Can. Desmond-Stephan Co., Hamilton Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Wheel Trueing Tool Co., Detroit, Mich.

Diamond Crossings
Can. Steel Foundries, Montreal, Que.

Die-Castings
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Dies, Pipe-Threading
Jones & Lamson Machine Co., Springfield, Vt.

Die Sinking Machines, Automatic
Jones & Lamson Machine Co., Springfield, Vt.
Walcott Lathe Co., Jackson, Mich.

Die Sinkers
Kimber & Hillier, St. Catharines, Ont.

Dies, Screw and Thread Cutting
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.

Dies, Sheet-Metal and Sub-Press (See Tool Work)
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

BUYERS' DIRECTORY

Dies, Forging
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.

Dies, Hammer
Kimber & Hillier, St Catharines, Ont.

Dies, Self-Opening, Adjustable
Can. Fairbanks-Morse Co., Ltd., Montreal
Geometric Tool Co., New Haven, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Prest-O-Lite Co. of Can., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

Dies, Threading-Opening
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que

Disc Cement
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill

Dividing Heads
Ackworthie, Ltd., John, Birmingham, Eng.
Dickow, Fred. C., Machinery Co., Chicago, Ill.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont

Dogs, Lathe and Milling Machine
Armstrong Bros. Tool Co., Chicago, Ill.

Drafting Boards and Tables
Darling Bros., Ltd., Montreal, Que
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

Drafting Materials
American Lead Pencil Co., New York City, N.Y.
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

Dressers, Grinding Wheel
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Joyce-Koebel Co., Inc., New York, N.Y.
Norton Co. of Can., Ltd., Hamilton, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

Drill Holders
Armstrong Bros. Tool Co., Chicago, Ill.

Drill Rods
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Aikenhead Hardware Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

Drill Speeders
Canada Machinery Corp., Galt, Ont.

Drilling Machine Heads
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg Co., Freeport, Ill.
United States Machine Tool Co., Cincinnati, Ohio.

Drilling Machines, Automatic
Hoosier Drilling Mach. Co., Goshen, Ind.
National Automatic Tool Co., Richmond, Ind.

Drilling Machines, Bench
Beacon Engineering Co., Tipton, England
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

Drilling Machines, Electric and Hand
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

Drilling Machines, Gang
Bertram & Son Co., Ltd., The John, Dundas, Ont
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Drilling Machines, Heavy Duty
Armstrong-Whitworth of Canada, Ltd Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Rockford Lathe & Drill Co., Rockford, Ill.

Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Holiy, R. S., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.

Drilling Machines, Multiple Spindle
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
National Acme Co., Cleveland, Ohio.
National Automatic Tool Co., Richmond, Ind.
Terry & Co., John C., Birmingham, Eng.

Drilling Machines, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

Drilling Machines, Portable
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

Drilling Machines, Radial
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Drilling Machines, Sensitive
Beacon Engineering Co., Tipton, England.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

Drilling Machines, Turret
Gisholt Machine Co., Madison, Wis.
Steinle Turret Machine Co., Madison Wis
Williams Machinery Co., A. R., Toronto, Ont.

Drilling Machines, Vertical
Aurora Tool Works, Aurora, Ind
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Hoosier Drilling Mach. Co., Goshen, Ind.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill
Rockford Lathe & Drill Co., Rockford, Ill
Perfect Machine Co., Ltd., Galt, Ont.
Terry & Co., John C., Birmingham, Eng.
Wellinger Co. of Can., Ltd., Chas A., Windsor, Ont.

Drills, Center
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Drills, High Speed Twist
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Sheffield Twist Drill & Steel Co., Sheffield, Eng.

Drills, Ratchet
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

Drills, Twist and Flat
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O
Can. Detroit Twist Drill Co., Walkerville, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.

Dust Handling Equipment
Can. Blower & Forge Co., Ltd., Kitchener.
Skinner Bros. Mfg. Co., Inc., St Louis, Mo
Sturtevant Co., B. F., Boston, Mass.

Electrical Instruments
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

Electrical Supplies
Atkins & Co., Inc., E. C., Indianapolis, I.
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que.
U.S. Electrical Tool Co., Cincinnati, O.

Elevating Trucks (See Trucks)
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

Elevators and Conveyors
Can. Link-Belt Co., Toronto, Ont
Can. Fairbanks-Morse Co., Ltd., Montreal
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

Emery Wheels (See Grinding Wheels)
Aikenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Hart Products, Ltd., Hamilton, Ont.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

Engines, Capstan
Kennedy & Sons, Wm., Owen Sound, Ont

Engineers, Mechanical
Ford-Smith Machine Co., Hamilton, Ont
Gisholt Machine Co., Madison, Wis.
Hamilton Gear & Machine Co., Toronto, Ont.
Perdue, W. B., San Francisco, Calif

Expanders, Tube
Garlock-Walker Mchy. Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont
Petrie, Ltd., H. W., Toronto, Ont.

Eyeglasses, Safety (See Goggles, Safety)
Prest-O-Lite Co. of Can., Toronto, Ont
Willson Goggles, Inc., Reading, Pa.

Fans, Electric
Can. Blower & Forge Co., Ltd., Kitchener
Can. Fairbanks-Morse Co., Ltd., Montreal
Northern Electric Co., Montreal, Que
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo
Sturtevant Co., B. F., Boston, Mass

Fans, Exhaust
Can. Blower & Forge Co., Ltd., Kitchener.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

Fans, Ventilating
Can. Blower & Forge Co., Ltd., Kitchener
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo
Sturtevant Co., B. F., Boston, Mass.

Fibre
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que

File Handles
Ingersoll File Co., Ltd., Ingersoll, Ont.

Files and Rasps
Atkins & Co., Inc., E. C., Indianapolis, I
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Nicholson File Co., Port Hope, Ont.
Simonds Canada Saw Co., Montreal, Que.

Filing Machines
Garlock-Walker Mchy Co., Toronto, Ont
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery & Supply Co., A. R., Montreal Que.

Filler, Iron (See Cements, Iron)
Smooth Mfg. Co., Jersey City, N.J.

Fire Extinguishers
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Fittings, Pipe
International Malleable Iron Co., Guelph, Ont.

Flexible Shafts
Aikenhead Hardware Ltd., Toronto, Ont.

Flux, Galvanizing
British Smelting & Refining Co., Ltd., Montreal, Que.

Fluxes, Welding
L'Air Liquide Society, Toronto, Ont.

Forging Machinery
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Garlock-Walker Mchy. Co., Toronto, Ont.
National Machinery Co., Tiffin, Ohio.
Stewart & Co., Duncan, Glasgow, Scot.

Forgings, Drop
Canada Foundries & Forgings Co., Welland, Ont.
Dominion Forge & Stamping Co., Ltd., Toronto, Ont.

Forgings, Hammer
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hepburn Ltd., John T., Toronto, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Steel Co. of Canada, Ltd., Hamilton, Ont.

Foundry Equipment
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

Foundry Supplies
Atkins & Co., Inc., E. C., Indianapolis, I.
Rice Lewis & Son, Ltd., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

Frogs, Spring or Rigid
Can. Steel Foundries, Montreal, Que.

Fuel Oil Burning System
General Combustion Co. of Can., Ltd., Montreal, Que.

Furnaces, Electric
Electric Furnace Construction Co., Philadelphia, Pa.
General Combustion Co. of Can., Ltd., Montreal, Que.

Furnaces, Heat Treating Coal
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.

Furnaces, Heat Treating Oil and Gas
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Bellevue Industrial Furnace Co., Detroit.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Furnaces and Ovens, Electric
Electric Furnace Construction Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto, Ont.
Volta Mfg. Co., Welland, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Furnaces, Tempering and Annealing
Brown & Sharpe Mfg. Co., Providence, R.I.
Electric Furnace Construction Co., Philadelphia, Pa.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Furniture, Machine Shop
Garlock-Walker Mchy. Co., Toronto, Ont.

Gages, Comparator
Jones & Lamson Machine Co., Springfield, Vt.
Herbert Ltd., Alfred, Toronto, Ont.
Johansson Inc., C. E., Windsor, Ont.
Perdue, W. B., San Francisco, Calif.
Starrett Co., L. S., Athol, Mass.

Gages, Measuring (See Tool Work)
Chesterman & Co., Ltd., J., Sheffield, Eng.
Crescent Machine Co., Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont
Starrett Co., L. S., Athol, Mass

Gages, Recording
Bristol Co., Waterbury, Conn.
Johansson Inc., C. E., Windsor, Ont.

You knew this Kid

You used to play with Jimmy on the sand lots—he was a speedy youngster, pitched an elegant game, but when it came to a really tough, hard-fought scrap he didn't have the strength—the bull dog *sticktoitiveness* to lick.

Of similar stuff are most high speed reamers—speedy but lacking in that thing called "guts." Their *backs* are weak—that's the reason. Their *bodies* are too brittle to stand up under long-continued pound and punishment.

That's because their bodies are made of high speed steel—the very *last* steel that belongs in the body of a high speed reamer.

PEERLESS HIGH SPEED REAMERS

Peerless High Speed Reamers are the type of reamer you perhaps imagined couldn't be made—their bodies are extremely tough alloy—brute strength where brute strength is most needed—toughness where toughness measures the life of the tool.

Peerless blades, however, are of high speed steel—selected stock in fact. These blades are countersunk and anchored into the body and then brazo-hardened so that the tough body and the high speed blades become one eternal unit.

Peerless High Speed Reamers are remarkable for their ability to "stand the gaff"—they have "guts"—and because their blades are selected and treated especially for use *as blades*—they display remarkable producing capacity—even for high speed reamers.

We Invite You to Try to "Stump" Peerless
On the Toughest Job in Your Shop

The Cleveland Twist Drill Co.

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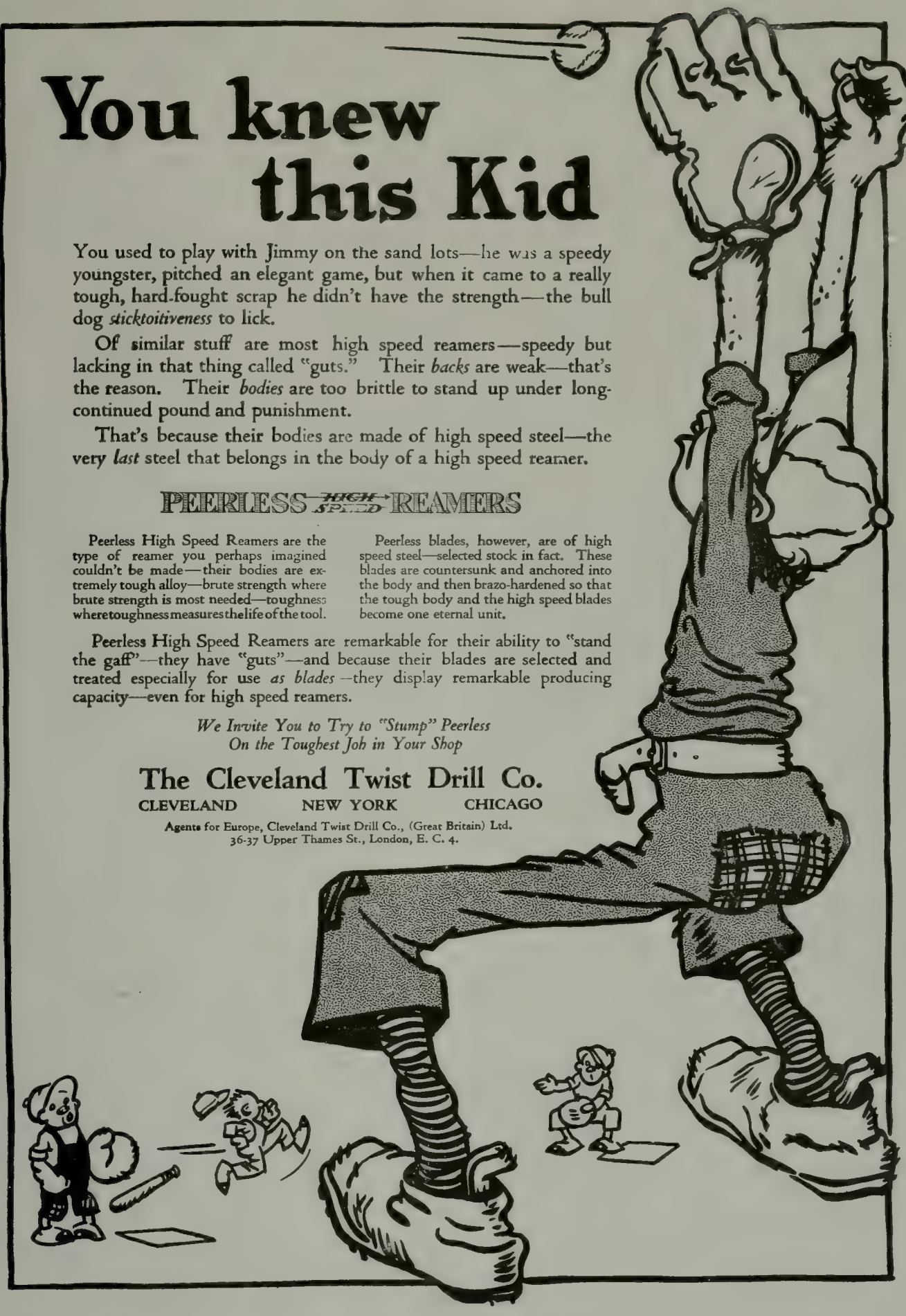
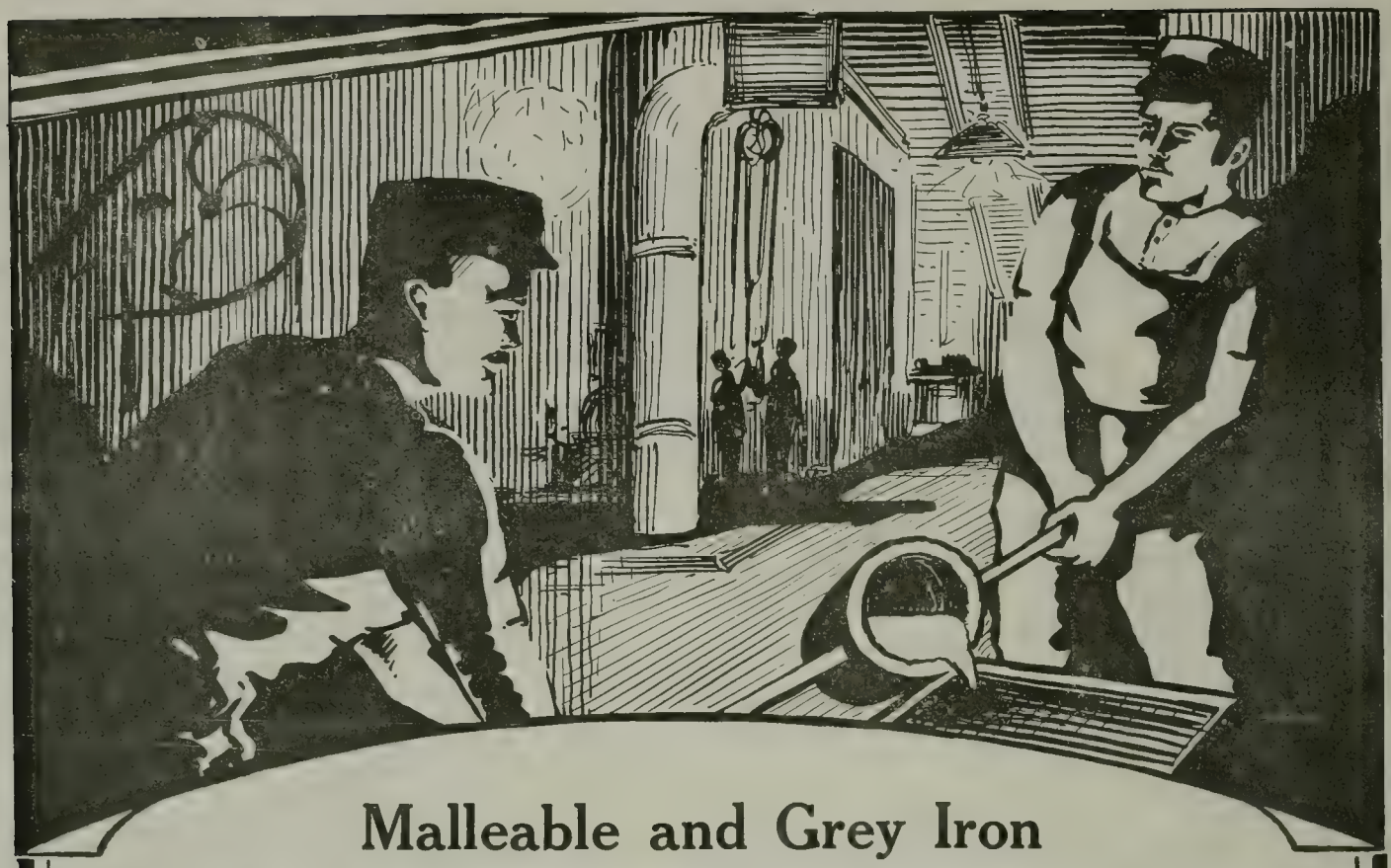
Agents for Europe, Cleveland Twist Drill Co., (Great Britain) Ltd.
36-37 Upper Thames St., London, E. C. 4.





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INTERNATIONAL MALLEABLE IRON COMPANY
LIMITED
GUELPH, ONTARIO, CANADA

BUYERS' DIRECTORY

Gages, Snap, Thread and Cylindrical
Ackworthie, Ltd., John, Birmingham, Eng.
Brown & Sharpe Mfg. Co., Providence, R I
Can. Fairbanks-Morse Co., Ltd , Montreal.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Gages, Special Measuring (See Tool Work)
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Gages, Standard
Armstrong Whitworth Co. of Can., Lt Montreal, Que.
Atkins & Co., Inc., E. C., Indianapolis.
Johansson Inc., C. E., Windsor, Ont.

Gages, Thread
Ackworthie, Ltd., John, Birmingham, Eng.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

Garnet, Emery and Flint Paper and Cloth
Ritchey Supply Co., Toronto, Ont.

Gas, Coal Compressed
L'Air Liquide Society, Toronto, Ont.

Gas, Compressed
Prest-O-Lite Co. of Can., Toronto, Ont.

Gaskets
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Smooth Mfg. Co., Jersey City, N.J.

Gear Blanks
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario.
Philadelphia Gear Works, Philadelphia, Pa.

Gear-Cutting Machines
Bertram & Son Co., Ltd , The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Fellows Gear Shaper Co., Springfield, Vt.
Petrie, Ltd., H. W., Toronto, Ont.
Whiton Machine Co., D. E., New London, Conn.

Gear Testing Machines
Brown & Sharpe Mfg. Co., Providence, R.I.

Gears, Cast
Can. Link-Belt Co., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hull Iron & Steel Foundries, Hull, Que.

Gears, Cut
Brown & Sharpe Mfg. Co., Providence, R.I.
Canadian SKF Co., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal, Q.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Steel Products Co., Brantford, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gardner & Son, Robt., Montreal, Que.
Hamilton Gear & Machine Co., Toronto, Ontario.
Hepburn Ltd., John T., Toronto, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.

Gears, Dressed
Kennedy & Sons, Wm., Owen Sound, Ont.

Gears, Forged
Canada Foundries & Forgings Co., Welland, Ont.
Lyman Tube & Supply Co., Montreal, Que.

Gears, Herringbone
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.
Philadelphia Gear Works, Philadelphia, Pa.

Gears, Machine Moulded
Can. Steel Foundries, Montreal, Que.

Gears, Rawhide (See Gears, Cut)
Hamilton Gear & Machine Co., Toronto, Ontario.
Philadelphia Gear Works, Philadelphia, Pa.

Gear, Silent Chain
Gardner & Son, Robt., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Can. Link-Belt Co., Ltd., Toronto, Can.
Hans Renold of Canada, Ltd., Montreal, Quebec.

Gears, Worm
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario.

Generators, Acetylene
L'Air Liquide Society, Toronto, Ont.

Generators, Electric
Holden Co., Ltd., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

Goggles, Safety
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont
Standard Optical Co., Geneva, N.Y.
Willson Goggles, Inc., Reading, Pa.

Grab Buckets
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

Grease Cups, Pressed Steel and Brass
Can. Winkley Co., Ltd , Windsor, Ont.

Greases, Lubricating
Canadian SKF Co., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.

Grinding Discs
Ritchey Supply Co., Toronto, Ont.

Grinding Machines
Brown & Sharpe Mfg. Co., Providence, R I.
Can. Fairbanks-Morse Co., Ltd., Montreal.

Grinding Machines, Abrasive Belt
Beacon Engineering Co., Tipton, England.
Norton Co. of Can., Ltd., Hamilton, Ont.

Grinding Machines, Automatic
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Grinding Machines, Bench
Aikenhead Hardware Ltd., Toronto, Ont.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Holly, R. S., Toronto, Ont.
La Salle Tool Co., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
McDougall Co., Ltd., R., Galt, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co , Rockford, Ill
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.
Terry & Co., John C., Birmingham, Eng.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Grinding Machines, Center
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

Grinding Machines Chaser
Jones & Lamson Machine Co., Springfield, Vt.

Grinding Machines, Cutter and Reamer
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy Co , Toronto Ont.
Greenfield Machine Co., Greenfield, Mass.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Grinding Machines, Cylindrical
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Grinding Machines, Die
Jones & Lamson Machine Co , Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich
National A me Co , Cleveland, Ohio
National Machinery Co., Tiffin, Ont.

Grinding Machines, Disc
Beacon Engineering Co., Tipton, England.
Ford-Smith Machine Co., Hamilton, Ont.

Grinding Machines, Drill
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Holden Co., Ltd., Montreal, Que.

Grinding Machines, Face
Ford-Smith Machine Co., Hamilton, Ont

Grinding Machines, Floor and Tool
Beacon Engineering Co., Tipton, England.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

Grinding Machines, Internal
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

Grinding Machines, Portable
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Wisconsin Electric Co., Racine, Wis.

Grinding Machines, Power Oscillating Tool
Herbert Ltd., Alfred, Toronto, Ont.

Grinding Machines, Ring Wheel
Ford-Smith Machine Co., Hamilton, Ont.

Grinding Machines, Snagging
Blount Co., J. G., Everett, Mass.
Norton Co. of Can., Ltd., Hamilton, Ont.

Grinding Machines, Surface
Garlock-Walker Mchy. Co., Toronto, Ont.
La Salle Tool Co., Ltd., La Salle, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Grinding Machines, Thread
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Grinding Machinery, Tool Post
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Gisholt Machine Co., Madison, Wis.
Wisconsin Electric Co., Racine, Wis.

Grinding Machines, Universal
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
La Salle Tool Co., Ltd., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Redford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.

Grinding Wheels
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co of Canada, Ltd., Brantford, Ont.

Guards, Machinery and Window
Can. Wire & Iron Goods Co., Hamilton, Ont.

Guards, Electric Lamp
Flexible Steel Lacing Co., Chicago, Ill.

Gun-Barrel Machinery
Steinle Turret Machine Co , Madison, Wis

Hack Saws, Power
Ackworthie, Ltd., John, Birmingham, Eng.
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Hamilton, Canada
Garlock-Walker Mchy. Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que
Starrett Co., L. S., Athol, Mass
Williams Machinery & Supply Co., A. R., Montreal, Que.

Hammers, Chipping
Cleveland Pneumatic Tool Co., Toronto, Ont.

Hammers, Drop
Bertram & Son Co., Ltd., The John, Dundas, Ont
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canada Machinery Corp., Galt, Ont.

Hammers, Electric
Aikenhead Hardware Ltd., Toronto, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

Hammers, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co , Grand Haven, Mich.

Hammers, Power
Bertram & Son Co , Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

Hammers, Riveting
Cleveland Pneumatic Tool Co., Toronto, Ont.

Hangers, Shafting
Can. Link-Belt Co., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Terry & Co., John C., Birmingham, Eng.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Hardening, Case-Hardening and Tempering
Hamilton Gear & Machine Co., Toronto, Ont.

Hardness Testing Apparatus
Shore Instrument Co., Jamaica, N.Y.

Heating
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo

Hobbing Machines
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

Hobs
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Hoists, Electric
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara-Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.
Volta Mfg. Co., Welland, Ont.

Hoists, Hand
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Ltd., Niagara-Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

Hoists, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Morris Crane & Hoist Co., Ltd., Niagara-Falls, Ont.
Northern Crane Works, Walkerville, Ont.

Holders-On, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

Hose, Flexible Steel
Can. Fairbanks-Morse Co., Ltd., Montreal
Ontario Metal Products Co , Ltd , Toronto, Ont.

Hose, Industrial
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

Hose, Rubber
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Foamite Firefoam Co , Hamilton, Ont.

Hydraulic Leather
Graton & Knight Mfg. Co., Worcester, Mass

Hydraulic Machinery
Bertram & Son Co , Ltd , The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.

Hydrogen
National Electro Products, Ltd., Toronto, Ont.

Index Centers
Dickow, Fred. C., Machinery Co., Chicago, Ill.

Igniters, Gas Engine
Canada Foundries & Forgings Co., Welland, Ont.

Indicators, Speed and Test
Aikenhead Hardware Ltd , Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.

Insulation
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

Jacks, Hydraulic
Norton, A. O., Boston, Mass.

Jacks, Planer
Armstrong Bros. Tool Co., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

Bilton Machine Co., Bridgeport, Conn.
Burgess & Marchand, Montreal, Que.
Crescent Machine Co., Ltd., Montreal, Q.

BUYERS' DIRECTORY

Jigs and Fixtures (See Tool Work)
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Rapid Tool & Machine Co., Lachine, Que.

Keyseating Machines
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Keys, Machine
Can. Drawn Steel Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.

Knives, Machine
Atkins & Co, Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.
Simonds Canada Saw Co., Montreal, Que.

Knurl Holders
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Lacing Leather
Clipper Belt Lacer Co., Grand Rapids, Mich.
Main Belting Co. of Can., Montreal, Que.

Lamps, Electric
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

Lathe Attachments
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ont.

Lathe Pans, Portable
Canada Machinery Corp., Galt, Ont.

Lathe Tools
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Hendey Machine Co., Torrington, Conn.

Lathes, Automatic and Semi-Automatic
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

Lathes, Bench
Archibald & Co., Chas. P., Montreal, Q.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Lathes, Boring
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.

Lathes, Chucking (See Lathes, Horizontal Turret, and Lathes, Vertical Turret)
Acme Machine Tool Co., Cincinnati, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
McDougall Co., Ltd., R., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

Lathes, Engine
Archibald & Co., Chas. P., Montreal, Q.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Lehmann Machine Co., St. Louis, Mo.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill
Roelefson Machine & Tool Co., Toronto, Ont.
Sidney Machine Tool Co., Sidney, Ohio.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Walcott Lathe Co., Jackson, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Lathes, Extension and Gap
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

Lathes, Heavy Duty Projectile Boring
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Blashill Wire Machy. Co., Ltd., Montreal
Sidney Machine Tool Co., Sidney, Ohio
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Lathes, Horizontal Turret
Acme Machine Tool Co., Cincinnati, Ohio.
Blount Co., J. G., Everett, Mass.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

Lathes, Polishing (See Polishing and Buffing Machines)
Ford-Smith Machine Co., Hamilton, Ont.

Lathes, Relieving
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
McDougall Co., Ltd., R., Galt, Ont.

Lathe, Universal Hand
Brown & Sharpe Mfg. Co., Providence, R.I.

Lathes, Screw-Cutting
Jones & Lamson Machine Co., Springfield, Vt.

Lathe, Speed and Hand
Blount Co., J. G., Everett, Mass.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Oliver Machy. Co, Grand Rapids, Mich

Lathes, Spinning
Terry & Co., John C., Birmingham, Eng.

Lathes, Threading
Canada Machinery Corp., Galt, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.

Lathes, Vertical Turret
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Roelefson Machine & Tool Co., Toronto, Ont.

Lathes, Wood Turning
Blount Co., J. G., Everett, Mass.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

Lead Pipe
Steel Co. of Canada, Ltd., Hamilton, Ont.

Lighting Fixtures
Northern Electric Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont

Linoleum Mill Machinery
Bertrams Ltd., Edinburgh, Scotland.

Liquid Air Plants
L'Air Liquide Society, Toronto, Ont.

Lockers, Clothes
Can. Foamite Firefoam Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

Lubricants
Cateract Refining Co., Toronto, Ont.
Oakley Chemical Co, New York, N.Y.

Lubricating Systems
Bowser, S. F., & Co., Ltd., Toronto, Can.

Machinists' Small Tools
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertrams Ltd., Edinburgh, Scotland.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Dodge Mfg. Co. of Can., Toronto, Ont.
Foss Machinery & Supply Co, Geo. F., Montreal, Que.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass.
Strelinger Co of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Manganese Steel
Can. Steel Foundries, Montreal, Que.

Mandrels, Expanding
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Mandrels, Solid
Atkins & Co., Inc., E. C., Indianapolis, I.
Cleveland Twist Drill Co Cleveland, O
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Measuring Machines
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Metals, Alloy
British Smelting & Refining Co., Ltd. Montreal, Que.
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Deloro Smelting & Refining Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
International Nickel Co. of Can., Ltd., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Moore & Son, Thos., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.
Tallman Brass & Metal, Ltd., Hamilton, Ontario.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Metalite Cloth
Ritchey Supply Co., Toronto, Ont.

Micrometer Calipers
Aikenhead Hardware Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Rice Lewis & Son, Ltd., Toronto, Ont.

Milling Attachments
Ackworthie, Ltd., John, Birmingham, Eng.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

Milling Machines
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.

Milling Machines, Automatic
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.

Milling Machines, Bench
Burke Machine Tool Co., Conneaut, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

Milling Machines, Hand
Burke Machine Tool Co., Conneaut, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.

Milling Machines, Horizontal and Planer Type
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont
Gooley Edlund Inc., Cortland, N.Y.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

Milling Machines, Plain
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

Milling Machines, Thread
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Milling Machines, Universal
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Milling Machines, Vertical
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Williams Machinery Co., A. R., Toronto, Ont.

Monel Metal
International Nickel Co. of Can., Ltd., Toronto, Ont.

Motors, Electric
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

Moulded Rubber Goods
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Nail Machinery
Sleeper & Hartley, Inc., Worcester, Mass.

Nails and Staples
Steel Co. of Canada, Ltd., Hamilton, Ont

Nickel, Bars, Sheets, Wire, Etc.
International Nickel Co. of Can., Ltd., Toronto, Ont.

Nickel Plating Outfits
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Nickel Silver
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

Nitrogen
L'Air Liquide Society, Toronto, Ont.

Nut Tappers (See Bolt and Nut Machinery)
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Greenfield Tap & Die Corp., Galt, Ont.
National Acme Co., Cleveland, Ohio.

Nuts, Finished and Semi-finished
Galt Machine Screw Co., Galt, Ont.

Nuts, Machine Screw
Torrington Company, Ltd., Upper Bedford, Que.

Nuts, S.A.E., Plain and Castellated
Galt Machine Screw Co., Galt, Ont.

Oil Filtering and Storage Systems
Bowser, S. F., & Co., Ltd., Toronto, Can.

Oil Storage Engineers
Bowser, S. F., & Co., Ltd., Toronto, Can.

Oils
Canadian Oil Companies, Ltd., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

Oil Hole Covers
Can. Winkley Co., Ltd., Windsor, Ont.

Oils, Soluble
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

Oxygen
Carter Welding Co., Toronto, Ont.
Dominion Oxygen Co., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.

Oxy-Acetylene Apparatus
L'Air Liquide Society, Toronto, Ont.

Packing, Hydraulic
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.

Packing, Steam
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.

Paper Mill Conveyors
Bertrams Ltd., Edinburgh, Scotland.

Patents
Fetherstonhaugh & Co., Ottawa, Ont.
Marion & Marion, Montreal, Que.

Pans, Wet and Dry
Frost Mfg. Co., Chicago, Ill.

Pattern-Shop Machinery (See Woodworking Machinery)
Canada Machinery Corp., Galt, Ont.
Oliver Machinery Co, Grand Rapids, Mich.

Patterns, Wood and Metal
Crescent Machine Co., Ltd., Montreal, Q.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Wraggis Pattern Works, Galt, Ont.

Penstocks, Steel
MacKinnon Steel Co., Sherbrooke, Que

BUYERS' DIRECTORY

Phosphor Tin
British Smelting & Refining Co., Ltd., Montreal, Que.

Photographic Duplicating Machines
Commercial Camera Co., Providence, R.I.

Pig Iron
Steel Co. of Canada, Ltd., Hamilton, Ont.

Pipe Bending Machines
American Pipe Bending Machine Co., Boston, Mass
Can. Fairbanks-Morse Co., Ltd., Montreal.
Underwood Corp., H. B., Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.

Pipe Couplings
Steel Co. of Canada, Ltd., Hamilton, Ont.

Pipe Cutting and Threading Machines
Can. Fairbanks-Morse Co., Ltd., Montreal.
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

Pipe and Nipple Threading Machines
Landis Machine Co., Inc., Waynesboro, Pa.

Pipe Fitters' Tools
Aikenhead Hardware Ltd., Toronto, Ont.
Crane Ltd., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

Pipe Threading Die Heads
Landis Machine Co., Inc., Waynesboro, Pa.

Piston-Ring Machines
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

Planers, Parallels
L. & P. Mfg. Co., Niagara Falls, Ont.

Planing Machines
Bertram & Son Co., Ltd., The John Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
L. & P. Mfg. Co., Niagara Falls, Ont.
Morton Mfg. Co., Muskegon, Mich.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

Planing Machines, Rotary
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.

Plate Rolls
Bertram & Son Co., Ltd., The John, Dundas, Ont.

Pneumatic Tools
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

Polishing and Buffing Machines
Ackworthle, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Blount Co., J. G., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

Pots, Steel
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.

Pressed Steel Parts
Ackworthie, Ltd., John, Birmingham, Eng.
American Pulley Co., Philadelphia, Pa.
Fisher Motor Co., Ltd., Orillia, Ont.

Presses, Arbor
Atlas Press Co., Kalamazoo, Mich.
Can. Fairbanks-Morse Co., Ltd., Montreal.
National Engineering Co., Sarnia, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

Presses, Drop and Forging
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Toledo Machine & Tool Co., Toledo, Ohio.

Presses, Foot and Hand
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Terry & Co., John C., Birmingham, Eng.

Presses, Forcing
Atlas Press Co., Kalamazoo, Mich.
Stewart & Co., Duncan, Glasgow, Scot.

Presses, Hydraulic
Baird Machine Co., Bridgeport, Conn.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Laurie Mfg. Co., Springfield, Ill.
Perrin Ltd., W. R., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.
Williams Machinery Co., A. R., Toronto, Ont.

Presses, Power
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, Ohio.

Presses, Screw
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

Profiling Machines
Aikenhead Hardware Ltd., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Protractors
Brown & Sharpe Mfg. Co., Providence, R.I.

Propellers
Kennedy & Sons, Wm., Owen Sound, Ont.

Pulleys, Cork Insert
American Pulley Co., Philadelphia, Pa.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Positive Clutch & Pulley Works, Toronto, Ont.

Pulleys, Metal and Fibre
American Pulley Co., Philadelphia, Pa.
Bernard Industrial Co., A., Fortierville, Que.
Can. Fairbanks-Morse Ltd., Montreal. Q.
Canadian SKF Co., Toronto, Ont.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kennedy & Sons, Wm., Owen Sound, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Pulp and Paper Mill Equipment
MacKinnon Steel Co., Sherbrooke, Que.

Pumps, Automobile Tire
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Pumps, Barrel and Boiler-feed
Trahern Pump Co., Rockford, Ill.

Pumps, Circulating and Coalant
Trahern Pump Co., Rockford, Ill.

Pumps, Geared and Hand
Trahern Pump Co., Rockford, Ill.

Pumps, Industrial
Trahern Pump Co., Rockford, Ill.

Pumps, Hydraulic
Can. Fairbanks-Morse Co., Ltd., Montreal
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.
Trahern Pump Co., Rockford, Ill.

Pumps, Lubricant and Oil
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Hepburn Ltd., John T., Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Trahern Pump Co., Rockford, Ill.

Pumps, Power
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Ltd., Montreal. Q.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Hepburn Ltd., John T., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

Punches, Center
Brown & Sharpe Mfg. Co., Providence, R.I.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Starrett Co., L. S., Athol, Mass.

Punches, Hand
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Jardine & Co., A. B., Hespeler, Ont.

Punches, Power
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

Punching Machines, Horizontal
Bertrams Ltd., Edinburgh, Scotland.

Pyrometers, Electric
Bristol Co., Waterbury, Conn.
General Combustion Co. of Can., Ltd., Montreal, Que.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Racks, Cut
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.

Racks, Storage (See Furniture, Machine Shop)
Brantford Oven & Rack Co., Brantford, Ont.

Rammers, Foundry
Holden Co., Ltd., Montreal, Que.

Reamer Holders
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Victor Tool Co., Waynesboro, Pa.

Reamers, Expanding
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
McCroskey Tool Corp., Meadville, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Reamers, Solid
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

Reamers, Taper
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Recorders, Temperature
Taylor Instrument Co., Rochester, N.Y.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Recorders, Time
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

Regulators, Automatic (for electric furnaces)
Volta Mfg. Co., Welland, Ont.

Rheostats
Northern Electric Co., Montreal, Que.

Resistance Materials
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Respirators
Willson Goggles, Inc., Reading, Pa.

Rivets
Parmenter & Bulloch Co., Gananoque, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

Rivet Heaters
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Volta Mfg. Co., Welland, Ont.

Rivet-Making Machinery
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
National Machinery Co., Tiffin, Ohio.

Riveting Machines
Bilton Machine Co., Bridgeport, Conn.
Can. Fairbanks-Morse Co., Ltd., Montreal
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Schuster Co., F. B., New Haven, Conn.

Rolling Mill Equipment
Stewart & Co., Duncan, Glasgow, Scot.

Rolls (Rubber Covered)
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Rudder Frames, Steel
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Rubber Goods, Mechanical
Quaker City Rubber Co., Philadelphia, Pa.

Rules, Steel
Chesterman & Co., Ltd., J., Sheffield, Eng.

Rules, Steel and Wood
Brown & Sharpe Mfg. Co., Providence, R.I

Rust Preventatives
Oakley Chemical Co., New York, N.Y.

Sand Equipment
Can. Link-Belt Co., Toronto, Ont.

Sand Mills
Frost Mfg Co., Chicago, Ill.

Sanding Machinery
Oliver Machy Co., Grand Rapids, Mich.

Sand Rammers, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

Saw Frames and Blades, Hack
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Inc., Hamilton, Ont.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.

Sawing Machines, Metal
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Herbert Ltd., Alfred, Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.

Sawing Machines, Power Hack
Ackworthie, Ltd., John, Birmingham, Eng.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Saw Sharpening Machines
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

Saw Tables, Universal
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

Saws, Circular Metal
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

Saws, Hand
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.

Saws, Hot and Cold
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.

Saws, High Speed Steel
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Hamilton, Canada.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

Saws, Metal Band
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

Saws, Metal, Power
Clemson Bros., Inc., Hamilton, Ont.

Saws, Metal Cutting
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Inc., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.

Saws, Milling
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Saws, Screw Slotting
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

Saws, Swing Cut-off
Oliver Machinery Co., Grand Rapids, Mich.

Scales
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Ltd., Montreal. Q.

Screens
Can. Wire & Iron Goods Co., Hamilton, Ont.

Screw Driving Machine
Canada Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

Screw Extractors
Cleveland Twist Drill Co., Cleveland, O.

Screw Machine Work
Barnes Co., Wallace, Bristol, Conn.
Cook Co., Asa S., Hartford, Conn.
National Acme Co., Cleveland, Ohio.
Tallman Brass & Metal Co., Hamilton, Ont.

BUYERS' DIRECTORY

Screw Machinery, Wood and Lag
Cook Co., Asa S., Hartford, Conn

Screw Machines
Brown & Sharpe Mfg Co., Providence, R.I.

Screw Machines, Automatic
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
National Acme Co., Cleveland, Ohio.

Screw Machines, Plain or Hand
Acme Machine Tool Co., Cincinnati, Ohio.
Greenfield Tap & Die Corp., Galt, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Warner & Swasey Co., Cleveland, Ohio.

Screw Machine Products
Torrington Company, Ltd., Upper Bedford, Que.

Screw Plates
Aikenhead Hardware Ltd., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.

Screws, Cap and Set
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.
Torrington Company, Ltd., Upper Bedford, Que.

Screws, Lock Cap
Torrington Company, Ltd., Upper Bedford, Que.

Screws, Machine
Barnes Co., Wallace, Bristol, Conn.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

Screws, Safety Set
Barnes Co., Wallace, Bristol, Conn.
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

Screws, Side Knob
Torrington Company, Ltd., Upper Bedford, Que.

Screws, Thumb
Torrington Company, Ltd., Upper Bedford, Que.

Second-Hand Machinery
(See Searchlight Section)
Petrie, Ltd., H. W., Toronto, Ont

Separators, Moisture and Oil
Bowser, S. F., & Co., Ltd., Toronto, Can
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

Separators, Oil and Waste
Bowser, S. F., & Co., Ltd., Toronto, Can

Shafting
Canada Foundries & Forgings Co., Welland, Ont.
Can. Drawn Steel Co., Hamilton, Ont.
N.S. Steel Co., Ltd., New Glasgow, N.S.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Shapes, Cold-Drawn Special Steel
Union Drawn Steel Co., Hamilton, Ont.

Shaping Machines
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Holly, R. S., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Smith & Mills Co., Cincinnati, Ohio
Walcott Lathe Co., Jackson, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

Shapers, Wood
Oliver Machinery Co., Grand Rapids, Mich.

Shears, Hand
Can. Blower & Forge Co., Ltd., Kitchener.

Shears, Power
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Stall Co., Inc., D. H., Buffalo, N.Y.
[illegible] & Co, Duncan, Glasgow, Scot
Toledo Machine & Tool Co., Toledo, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.

Shearing Machines, Angle, Iron Bar and Gate
Bertrams Ltd., Edinburgh, Scotland.

Sheet Metal Working Machinery
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Terry & Co., John C., Birmingham, Eng.
Toledo Machine & Tool Co., Toledo, Ohio.

Sheets, Nickel, Resist, Alloy
International Nickel Co. of Can., Ltd., Toronto, Ont.

Sheets, Nickel, Monel and Fibre
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

Side Frames, Locomotive
Can. Steel Foundries, Montreal, Que
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Slotting Attachments
Ford-Smith Machine Co., Ltd., Hamilton, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
National Acme Co., Cleveland, Ohio.

Slotting Machines
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Herbert Ltd., Alfred, Toronto, Ont.

Solders
British Smelting & Refining Co., Ltd., Montreal, Que.
Hoyt Metal Co., Toronto, Canada.

Snap Flasks
Oliver Machy. Co., Grand Rapids, Mich

Special Machinery and Tools
Brown Engineering Corp., Ltd., Toronto.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

Specialties, Headed Work
Torrington Company, Ltd., Upper Bedford, Que.

Spectacles, Industrial
Willson Goggles, Inc., Reading, Pa.

Springs
Barnes Co., Wallace, Bristol, Conn.
Cleveland Wire Spring Co., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Steele Ltd., James, Guelph, Ont.

Spring-making Machinery
Sleeper & Hartley, Inc., Worcester, Mass.

Sprockets and Chains
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

Squares
Brown & Sharpe Mfg. Co., Providence, R.I.

Stamping, Metal
American Pulley Co., Philadelphia, Pa
Barnes Co., Wallace, Bristol, Conn.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Fisher Motor Co., Ltd., Orillia, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich
Parmenter & Bulloch Co., Gananoque, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

Stamps, Steel
Diamond Saw & Stamping Works, Buffalo, N.Y.

Stairways, Wrought Iron
Can. Wire & Iron Goods Co., Hamilton, Ont.

Steam Specialties
Crane Ltd., Montreal, Que

Steel Plate
Dom. Foundries & Steel, Hamilton, Ont

Steels, Tool
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vulcan Crucible Steel Co., Aliquippa, Pa.

Steel Blooms and Billets
Steel Co. of Canada, Ltd., Hamilton, Ont

Steel, Cold-Rolled Strip
Andrews Steel Co., Newport, Ky.
Barnes Co., Wallace, Bristol, Conn.
Can. Driver-Harris Co., Walkerville, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Ontario Metal Products Co., Ltd., Toronto, Ont.

Steel Castings
Dom. Foundries & Steel, Hamilton, Ont.

Steel Forgings
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Steel, Shafting and Free Cutting Screw
Barnes Co., Wallace, Bristol, Conn
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.

Steel, Sheet
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Toronto Iron Works, Toronto, Ont.

Steel, Tanks
Can. John Wood Mfg. Co., Toronto, Ont.

Steel, Stainless
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

Steel Wire Rods
Steel Co. of Canada, Ltd., Hamilton, Ont.

Steels, Alloy, Open Hearth and Electric
United Alloy Steel Corp., Canton, Ohio.

Steels, Alloy and Carbon
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Andrews Steel Co., Newport, Ky.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Barnes Co., Wallace, Bristol, Conn.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

Steels, High-Speed
Armstrong Bros. Tool Co., Chicago, Ill.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Baines & David, Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Drury Ltd., H. A., Montreal, Que.
Firth & Sons, Ltd., Thos., Montreal, Q.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

Steel, Magnet
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

Steel, Structural
MacKinnon Steel Co., Sherbrooke, Que.

Steel Tubing, Close Joint and Welded
Standard Tube & Fence Co., Ltd., Woodstock, Ont.

Stern Frames, Cast Steel
Can. Steel Foundries, Montreal, Que
Dominion Foundries & Steel, Ltd., Hamilton, Ont

Straightening Machinery
Bertrams Ltd., Edinburgh, Scotland.

Studs
Galt Machine Screw Co., Galt, Ont

Surface Plates
Bilton Machine Co., Bridgeport, Conn.

Swaging Machines
Atkins & Co., Inc., E. C., Indianapolis, I

Switches, Railway
Can. Steel Foundries, Montreal, Que

Switches and Switchboards
Northern Electric Co., Montreal, Que

Tablets, Bronze, Memorial
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Tachometers
Aikenhead Hardware Ltd., Toronto, Ont.
Bristol Co., Waterbury, Conn

Tanks, Steel
MacKinnon Steel Co., Sherbrooke, Que

Tanks and Pumps, Oil
Bowser, S. F., & Co., Ltd., Toronto, Can
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Toronto, Ont.

Taper Cutting Dies
Jones & Lamson Machine Co., Springfield, Vt.

Tap Holders
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont

Taper Pins
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Tapes, Measuring
Chesterman & Co., Ltd., J., Sheffield, Eng.
Starrett Co., L. S., Athol, Mass.

Tapping Machines and Attachments
Ackworthle, Ltd., John, Birmingham, Eng
Archibald & Co., Chas. P., Montreal, Q
Burke Machine Tool Co., Conneaut, Ohio
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

Taps and Dies
Ackworthle, Ltd., John, Birmingham, Eng
Butterfield & Co., Inc., Rock Island, Que.
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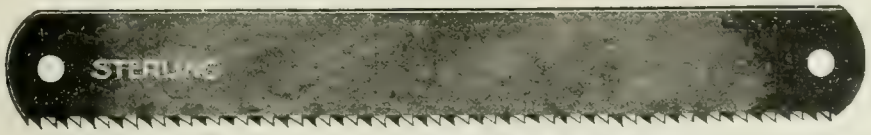

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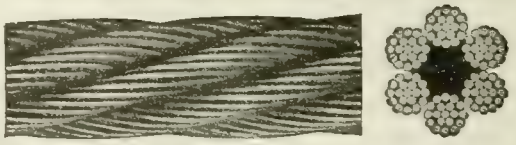

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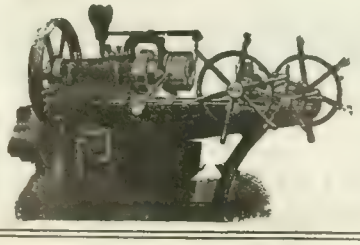

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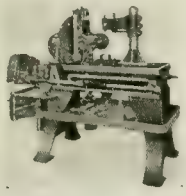

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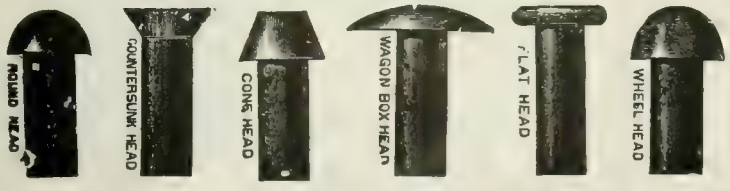

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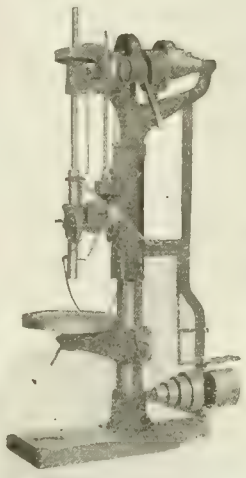

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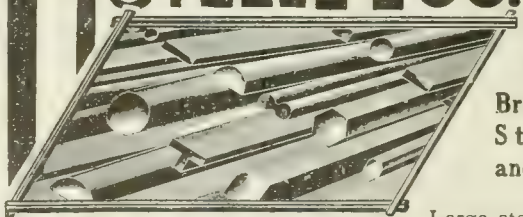

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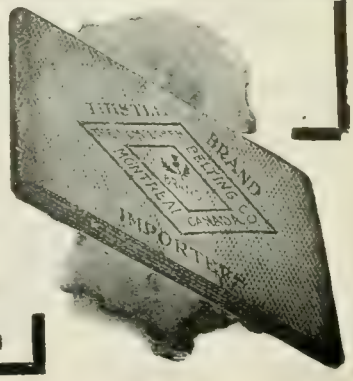

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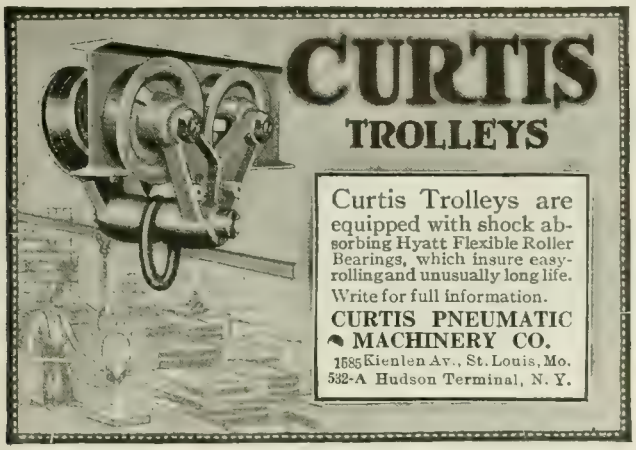

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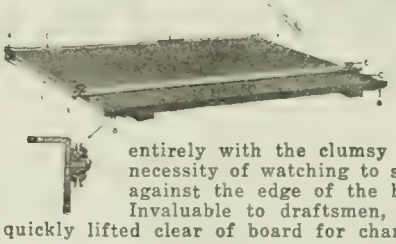

A simple arrangement which does not interfere with work on the drafting board in any way. It does away entirely with the clumsy "T" square and the necessity of watching to see that it is always against the edge of the board.
Invaluable to draftsmen, absolutely accurate, quickly lifted clear of board for changing drawings.
May we send circular giving full particulars?

Economy Drawing Table & Mfg. Co.
ADRIAN, MICH.

ALL KINDS
Spur, Bevel, Spiral, Herringbone and Intermittent Gears
in all metals, rawhide or fibre.

The best of service — try us on a Rush Order.

Distributors of Diamond Chains.

Our catalogue is full of gear data—yours for the asking.

PHILADELPHIA GEAR WORKS
Vine Street
PHILADELPHIA, PA.

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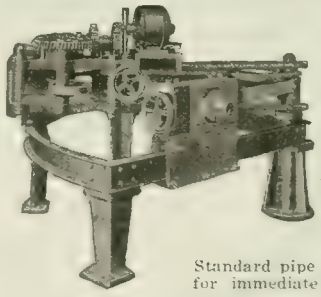


Cold Pipe Benders
Standard of the world

Bends all sizes of Pipe from ⅛" to 8" hand or motor operated.

Send for Catalog

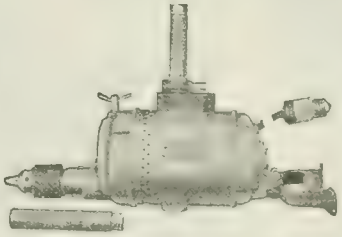
Standard pipe bends 1" to 6" pipe in stock for immediate delivery.

American Pipe Bending Machine Co.
52 Pearl St., Boston, Mass., U. S. A.

STEEL CASTINGS
1 to 5,000 pounds
Highest Quality
PROMPT AND RELIABLE SERVICE

SWEDISH CRUCIBLE STEEL CO. OF CANADA, Ltd., Windsor, Ont.

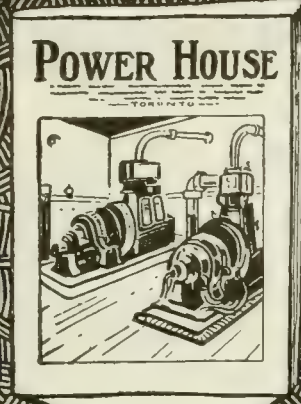
CINCINNATI
PORTABLE ELECTRIC DRILLS



For rapid drilling in steel, cast iron, sheet metal, wood, etc. Attach to lamp socket they're ready to use.

Write for complete catalog of Cincinnati Portable Electric Drills and Grinders. Address Dept. G-2.

The Cincinnati Electrical Tool Co.
Cincinnati, O.
"THE DRILL THAT WILL"



Obligations

These four dominant factors of Canadian industry —Power House, Canadian Machinery, Canadian Foundryman, and Marine Engineering—are all members of the Audit Bureau of Circulations and of the Canadian National Newspapers and Periodicals Association.

These memberships entail obligations which are a protection to both subscriber and advertiser. The first requires perfect frankness with regard to circulation. The second, that the subscribers' and advertisers' interests shall receive first consideration. MacLean Publications give their clientele absolute protection as well as service of a high order.

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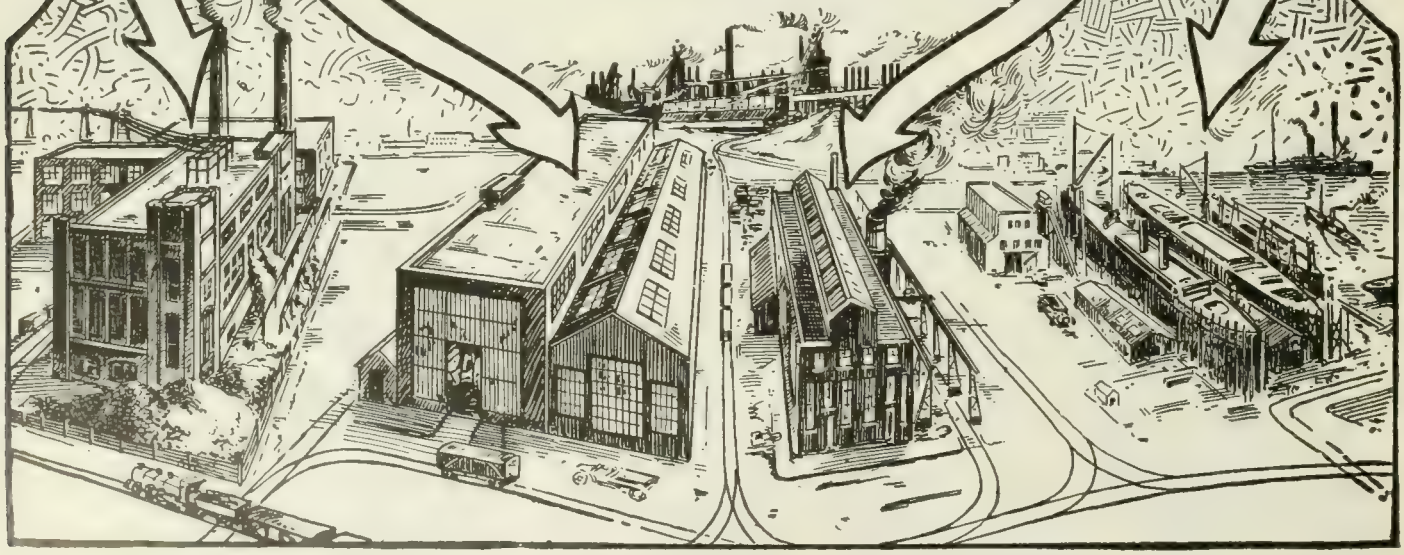

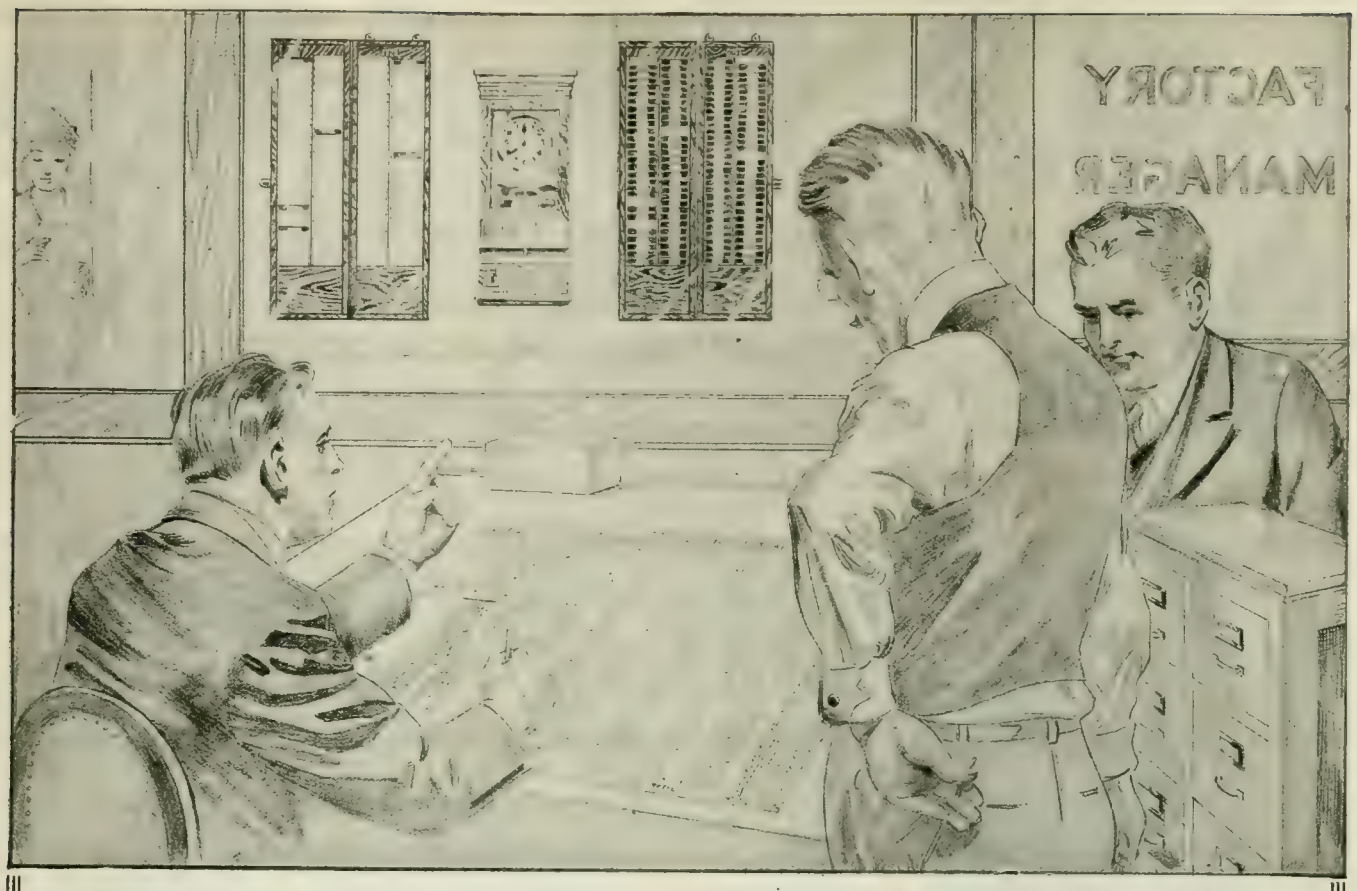

Jones Is a Punctual Worker *but*— Is Jones a Productive Worker?

The Factory Manager who is up-to-date will tell you at a glance. He uses Job Time Clock Records.

International Job Time Recorders offer the most accurate means of accounting for every employee's time, and of showing to what job it is charged.

They show the starting time of each job. They show the stopping time of each job. They tell whose time and how much time has been put into a specific job.

The record is printed, legible, accurate—there is no research; there are no questions and no disputes.

Oldest and Only Made in Canada

As pioneers in the Time Recording Industry we have advanced from a very simple beginning. To-day we are the largest manufacturers in the world of payroll and job time recording equipment. Our products are everywhere accepted as the best word in time recording equipment. They are made in Canada.

International Time Recorders

Account For and Protect, Minute For Minute, Your Time Investment

The illustration above shows how the modern, efficient factory manager is enabled to check his "Job" time with his "In and Out" time. The International Time Recorder records show in an instant the total of non-productive time in any department in any week or month. Non-productive Time means a Payroll leak—Stop it!

International Business Machines Co., Limited

F. E. MUTTON, Vice-President and General Manager

Head Office and Factory, 300-350 Campbell Avenue, Toronto

For your convenience we have Service and Sales Offices in Vancouver, Winnipeg, Walkerville, London, Hamilton, Toronto, Ottawa, Montreal, Quebec, Halifax, St. John's, Nfld.

Also manufacturers of International Dayton Scales and International Electric Tabulators and Sorters.

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CUT GEARS

Theoretically Correct

PROMPT SERVICE

ROBERT GARDNER & SON

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52 NAZARETH ST., MONTREAL, P. Q.

RAWHIDE OR METAL

MURCHEY

You Don't Have to Scrap Murchey Taps

If you are scrapping your taps when the cutting edge becomes worn you're not getting real Tap Economy.

Murchey Solid Adjustable Taps do not have to be scrapped when the cutting edge is worn. You simply buy a new set of chasers for a comparatively small sum and you have a new tap, equal in accuracy to the best solid tap and at a much lower cost. We give special service in supplying chasers.

Let us send you this tool on approval.

Write to-day.

Murchey Machine & Tool Co.

75 Porter Street : : Detroit, Michigan

The Coats Machine Tool Company, Ltd., 14 Palmer St., Westminster, London, S.W., England.
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STEEL PLATE CONSTRUCTION

Oil Storage, Gasoline Tanks, Air Receivers, Pneumatic Water Supply Tanks, Smoke Stacks, Boiler Breeching, Riveted Steel Pipe, Bins and Hoppers.

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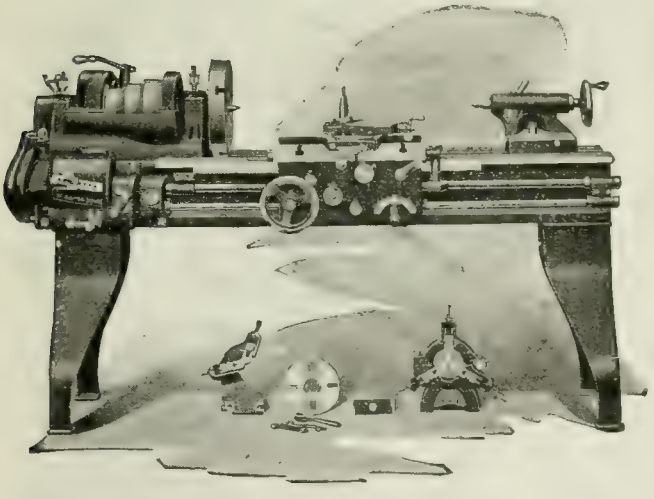
The **Rockford** *"ECONOMY"*

Small in Size Big in Production

A powerful, back geared, quick-change lathe for rapid, accurate production. Built in 12, 14, 18 and 22-in. swing.

Particulars upon request.



Rockford Lathe and Drill Co.
ROCKFORD, ILLINOIS, U.S.A.

Manufacturers:

The Sheffield Twist Drill & Steel Co., Ltd.

Works: Summerfield Street, Sheffield.

To **PROMOTE TRADE** within the **EMPIRE, CANADIAN MANUFACTURERS** will find that **"DORMER BRAND DRILLS"** meet all requirements. **QUALITY DRILLS** for quick drilling—USE **"DORMER."**

Sheffield Engineering Supplies Limited,
230, Craig Street West,
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High Speed Twist DORMER / BRAND *Drills*

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BABBITTS—METALS—SOLDERS

HOYT METAL COMPANY

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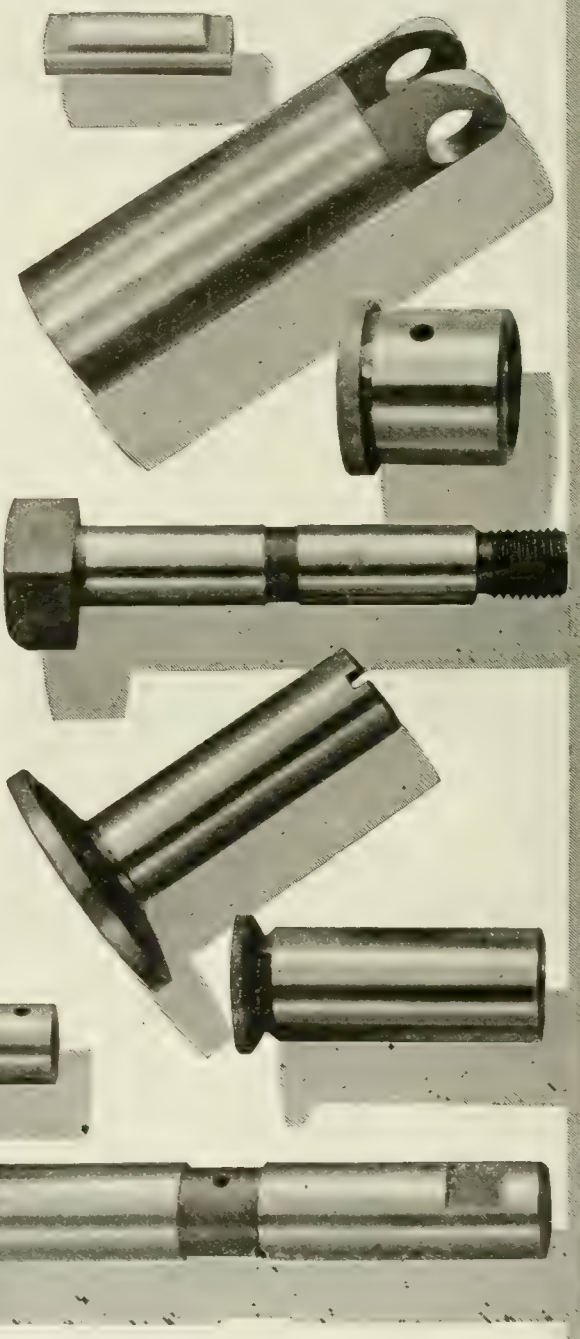
NAMCO

HARDENED AND GROUND SCREW MACHINE PARTS



Special

Screw machine product up to 2¼ in. diam.—to specifications. Hardened and ground screw product—to specifications.

Standard

V. & U. S. S. Semi-finished Nuts
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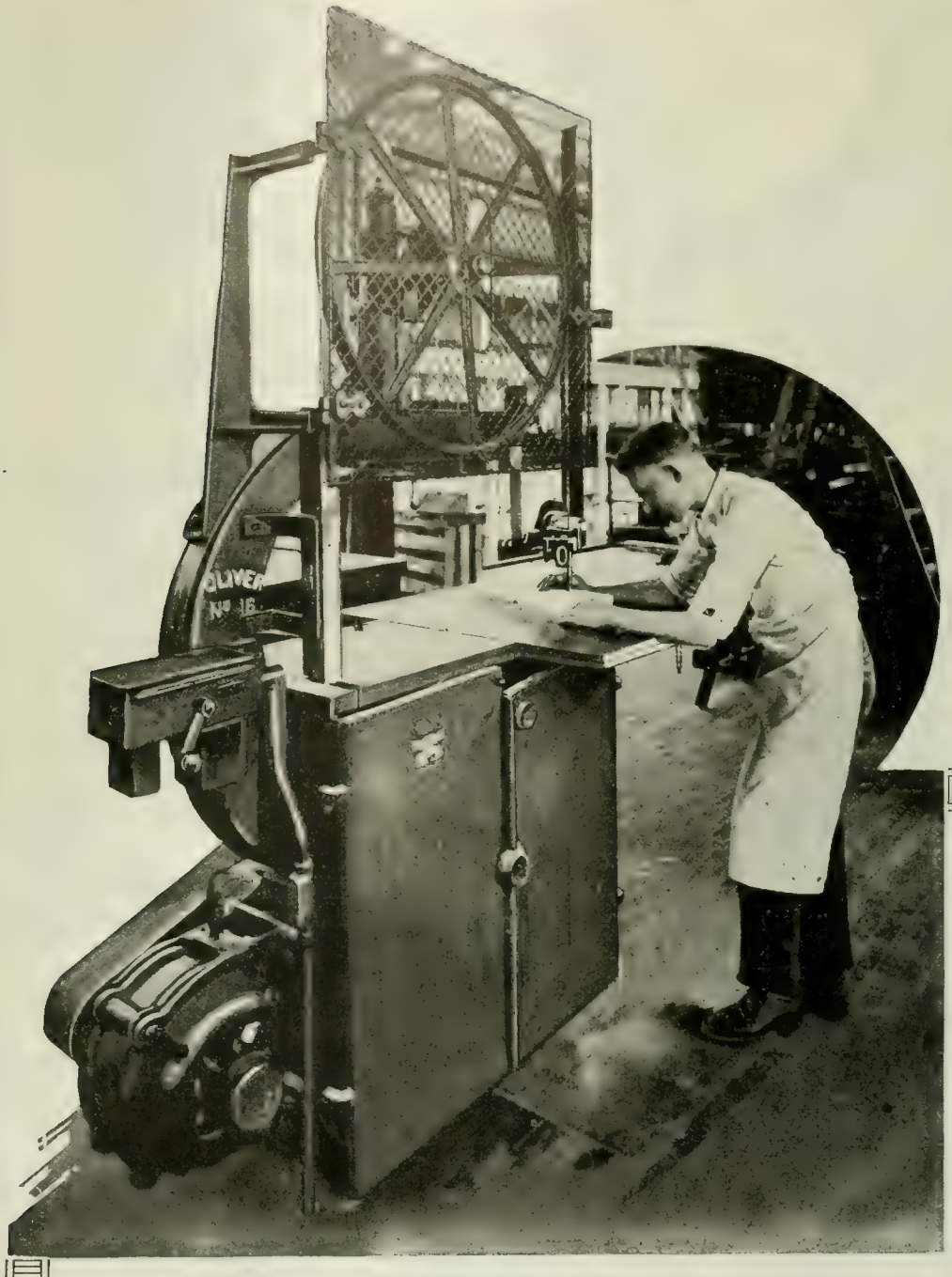
THE NATIONAL ACME COMPANY
MONTREAL, P. Q.

De Courcelles G.T.R.R.



"OLIVER"

"Oliver" Band Saws

Age is a relentless sifter of equipment. Only the best survives. An "Oliver" five-year-old is in its youth; an "Oliver" ten-year-old is in its prime with earning power unimpaired.

Here is an "Oliver" Band Saw surviving inferior equipment in the up-to-date pattern shop of the Chase Metal Works at Waterbury, Conn., a shop where they spare no pains to make every operation as efficient as possible.

This Band Saw is guarded in accordance with the very best practice. The bearings are large and frictionless and with the iron wheels milled even on the inside and perfectly balanced, steady operation and uniform sawing results.

Adapted to a wide variety of work the "Oliver" Band Saws have met with the approval of a great number of the largest woodworking concerns throughout the world. Let them demonstrate their working qualities in your plant.

Woodworking Machinery of Quality

MANUFACTURED BY THE

OLIVER MACHINERY CO.

Grand Rapids, Michigan, U.S.A.

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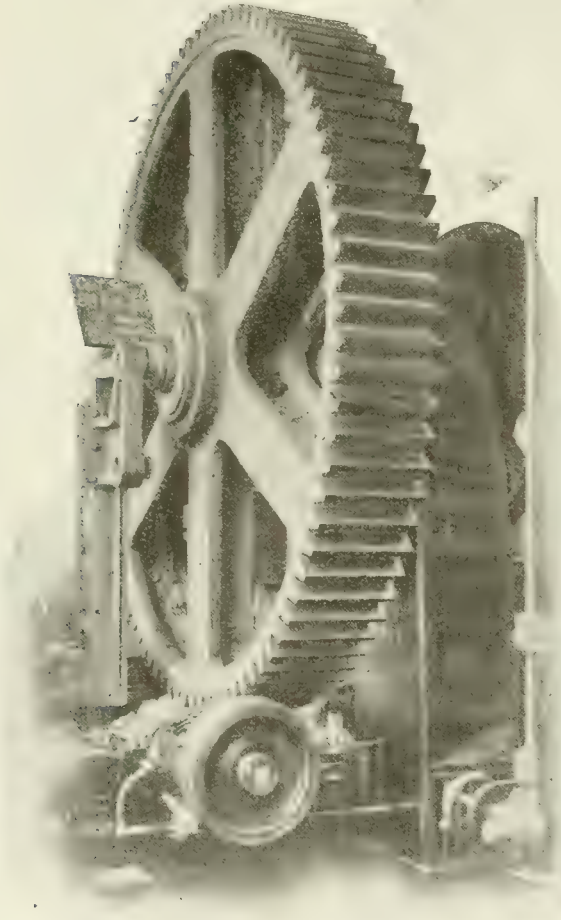
Heavy Gears of Reliable Designs



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Hamilton Gear & Machine Co.

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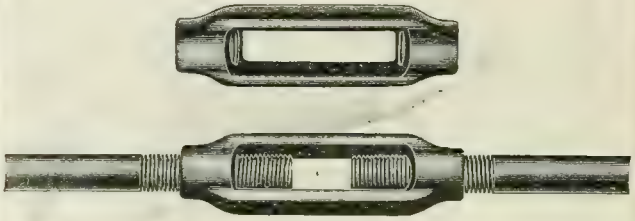
Drop Forged Steel



SOLID—NOT WELDED

16 Sizes with / without } Stubs

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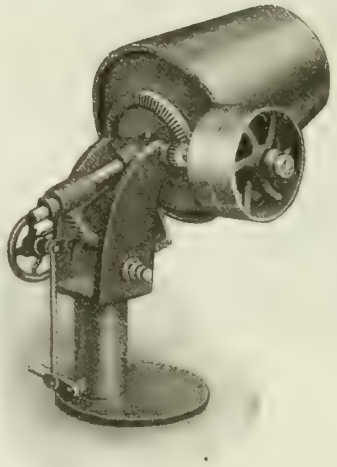
Welland, Ont.



TUMBLING BARRELS

STEAM and POWER

Pumps

STEEL BARRELS
Black and Galvanized.

It will pay you to send inquiries to us when open for any of these lines.

High-Class Made-in-Canada Equipment at close prices

The Smart - Turner Machine Co. Limited
Hamilton, Canada.

MORROW TALKS

Over a decade ago Canada imported her entire requirements of Twist Drills.

In 1909 the Morrow Company began operations in its Twist Drill plant.

It was the pioneer drill plant in Canada.

Since then the capacity of the Morrow Drill plant has been increased five-fold.

Why?

Because the founder's dictum that "it pays to make the best" has actuated the Company throughout its career.

Your satisfaction is positively guaranteed with every drill.

Order to-day by the name "Morrow"

Try your jobber first

Please note our new Montreal address:

The John Morrow Screw & Nut Co., Ltd.

489 St. Paul Street West

Montreal, Quebec

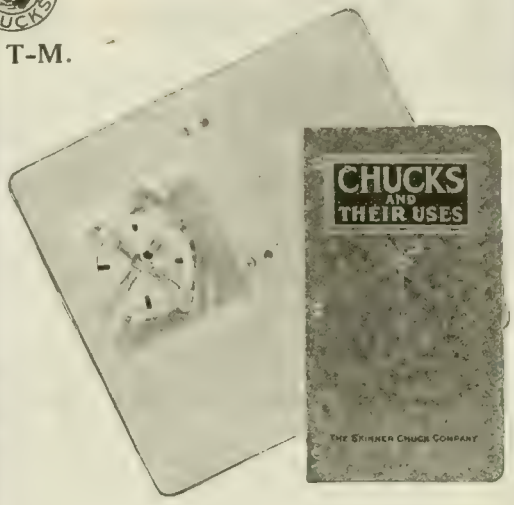
Phone M. 8418

The John MORROW Screw & Nut Co. Limited

Ingersoll Canada

SKINNER CHUCKS

T-M.



For Better Chuck Service

We have manufactured chucks for thirty odd years, and during this time have naturally acquired much data and information not in the possession of chuck users generally. We felt that this information, placed for ready reference in the hands of those interested in chucks, would help them to secure the fullest measure of service from their chucks. Therefore, we have just published a conveniently sized hand-book entitled

"CHUCKS AND THEIR USES"

Those interested will receive a copy of this book without charge. It includes:

- A history of chucks, and their development;
- A full description in every-day language of the different types of standard chucks;
- Suggestions for the proper care of chucks;
- Best methods of fitting chucks to lathes;
- Suggestions for general shop practice.

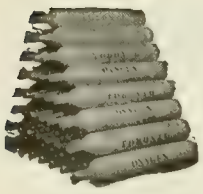
A number of these books, distributed among the mechanics in shops, should prove of value. A copy will be sent free upon request to anyone giving personal name and occupation.

Write for your copies now. No charge

THE SKINNER CHUCK COMPANY

NEW BRITAIN, CONN U S A

Established 1887



OXYGEN AND HYDROGEN
(ELECTROLYTIC)

National Electro Products Limited is the largest manufacturer of Electrolytic (pure) Oxygen and Hydrogen in Canada.

WE PRODUCE GASES EXCLUSIVELY BY ELECTROLYTIC DECOMPOSITION OF WATER

We are, therefore, in a position to furnish Oxygen and Hydrogen far superior to like gases made by any other process.

After Exhaustive Tests We Have Decided to Handle the Well-Known

The Torch for Welders OXYGEN PUROX HYDROGEN Who Want the Best!

WELDING AND CUTTING TORCHES

Our entire organization—technical and sales—is always at your service.

NATIONAL ELECTRO PRODUCTS
LIMITED

HEAD OFFICE: 87 CHURCH STREET, TORONTO

TORONTO SALES OFFICE	MONTREAL SALES OFFICE AND FACTORY	TORONTO FACTORY
87 Church Street	149 Moreau Street	295 Dufferin Street
Main 881 and 1626	Lasalle 508	Park 7656

The New Stirring and Stabilizing Process

Perfectype COMPLETE WELDING and CUTTING Equipment

Safe *Saves Money* *Makes Better Welds*

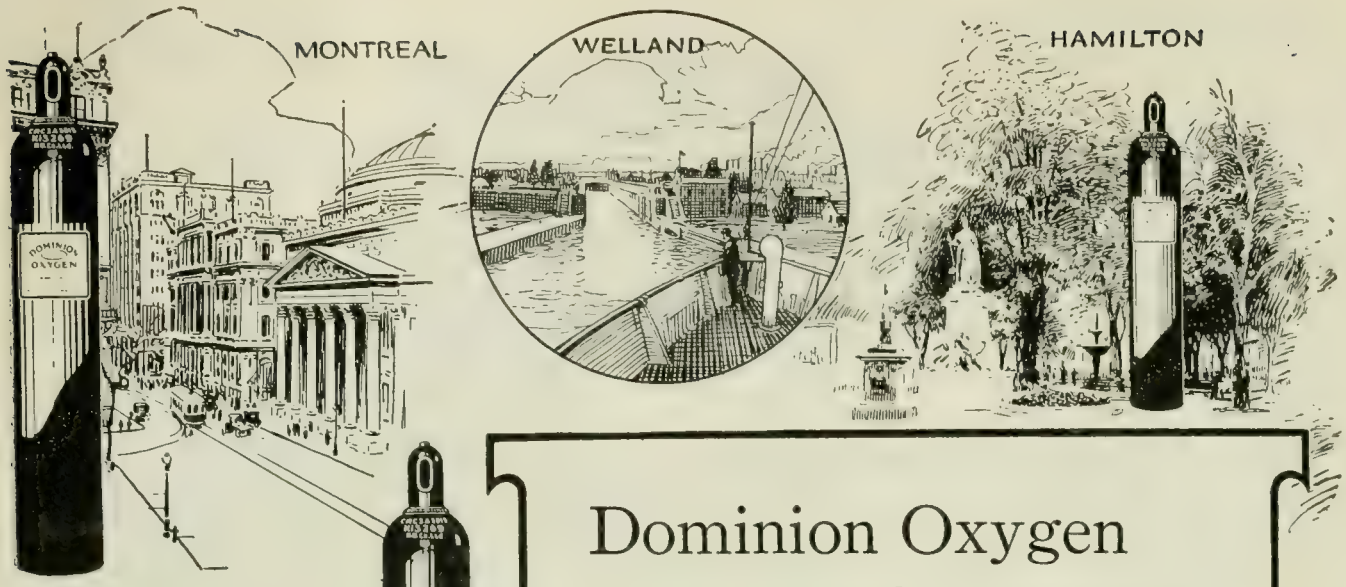
Regulators *Torches for Every Purpose* *Generators*

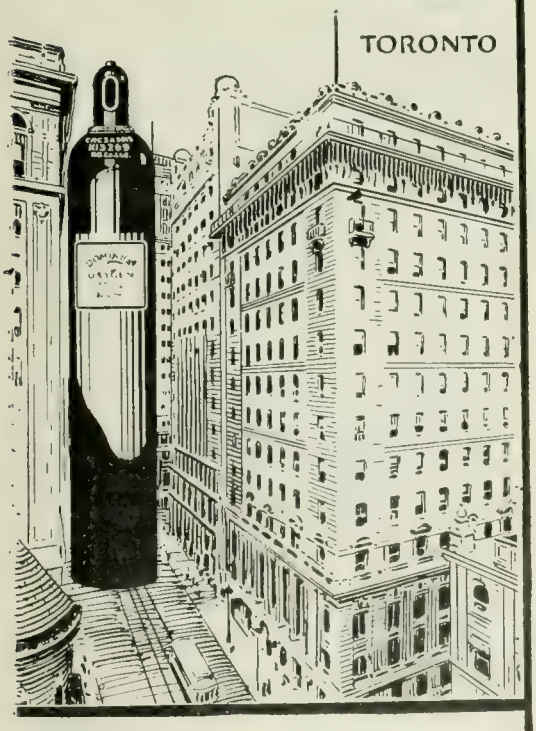
Canadian orders for Perfectype Special Type "A" Cutwelding Torches with 90 degree cutting head and 2 cutting tips, standard angle welding head and 5 welding tips of pure red copper will be delivered, duty and postage prepaid, from nearest jobber at the special price of $65.00.

Will consider inquiries from live dealers and jobbers who care to stock torches in lots of five or more. Territory granted. Inquiries confidential.

Address all orders and correspondence

W. B. PERDUE, 1220 Post Street SAN FRANCISCO, Cal.





Dominion Oxygen

Is Ready for Immediate Delivery Anywhere in Any Quantity

IN accordance with its published program of expansion, the Dominion Oxygen Company, Limited, announces the opening of still another Distributting Station at Welland.

This new link in the Dominion Oxygen Service chain, together with similar stations at Montreal, Hamilton, Windsor and Toronto, make it possible to supply highly pure oxygen in any desired quantity to any point.

Every order for Dominion Oxygen is filled on the day it is received, thus insuring to Canadian oxygen users a never-failing and prompt supply in high capacity cylinders built for economical and safe handling.

By maintaining the high standard of purity of its product and by developing still further the efficiency of its distributing organization, the Dominion Oxygen Company, Limited, will strive to continue to merit the generous patronage accorded it by Canadian oxygen users.

DOMINION OXYGEN COMPANY, LIMITED

Hillcrest Park, Toronto

Hamilton Montreal, Welland, Windsor

D-16

If interested tear out this page and place with letters to be answered.

The ambulance of industry

THE oxy-acetylene welder's hand truck is the ambulance of the modern machine shop.

Instantly accessible, quickly and easily wheeled to any part of the shop, wherever the job may be—the oxy-acetylene outfit saves thousands of dollars by eliminating delay and reclaiming broken parts.

Prest-O-Lite Dissolved Acetylene has made possible the use of a highly pure gas in an easily portable and economical form.

A chain of plants and warehouses ***insures*** a neverfailing and prompt supply of this most useful of gases in any quantity anywhere.

Prest-O-Lite

DISSOLVED ACETYLENE

PREST-O-LITE COMPANY OF CANADA, LIMITED

HILLCREST PARK, TORONTO

Branches at: Montreal Toronto Winnipeg

Plants at: Toronto, Ont. St. Boniface, Man. Merritton, Ont. Shawinigan Falls, P.Q.

P.W.C. 537

IMPERIAL CARBIDE

For Weding Cutting and Lighting

HIGHEST GAS YIELD IMPERIAL CARBIDE MADE IN CANADA

It insures **effectiveness** and **economy** by **invariably** producing acetylene gas of **unusual purity.**

Manufactured by

Union Carbide Co. of Canada, Ltd.

WELLAND, ONTARIO

Large Stocks maintained at convenient distributing centres throughout Canada

C N C

COLUMBIA PYRAMID BRUSHES
FOR MOTORS AND GENERATORS

Uniform in Structure
Uniform in Capacity
Uniform in Size
Uniform in Performance

There is the one BEST type of Columbia Pyramid Brush for YOUR generator or motor, whatever its make. . . . . Tell us what your machine is, and we will put on exactly the brush it needs.

CANADIAN NATIONAL CARBON CO.
LIMITED

Toronto and Winnipeg

4420

Robertson Process Ventilators

Made of Robertson Process Metal

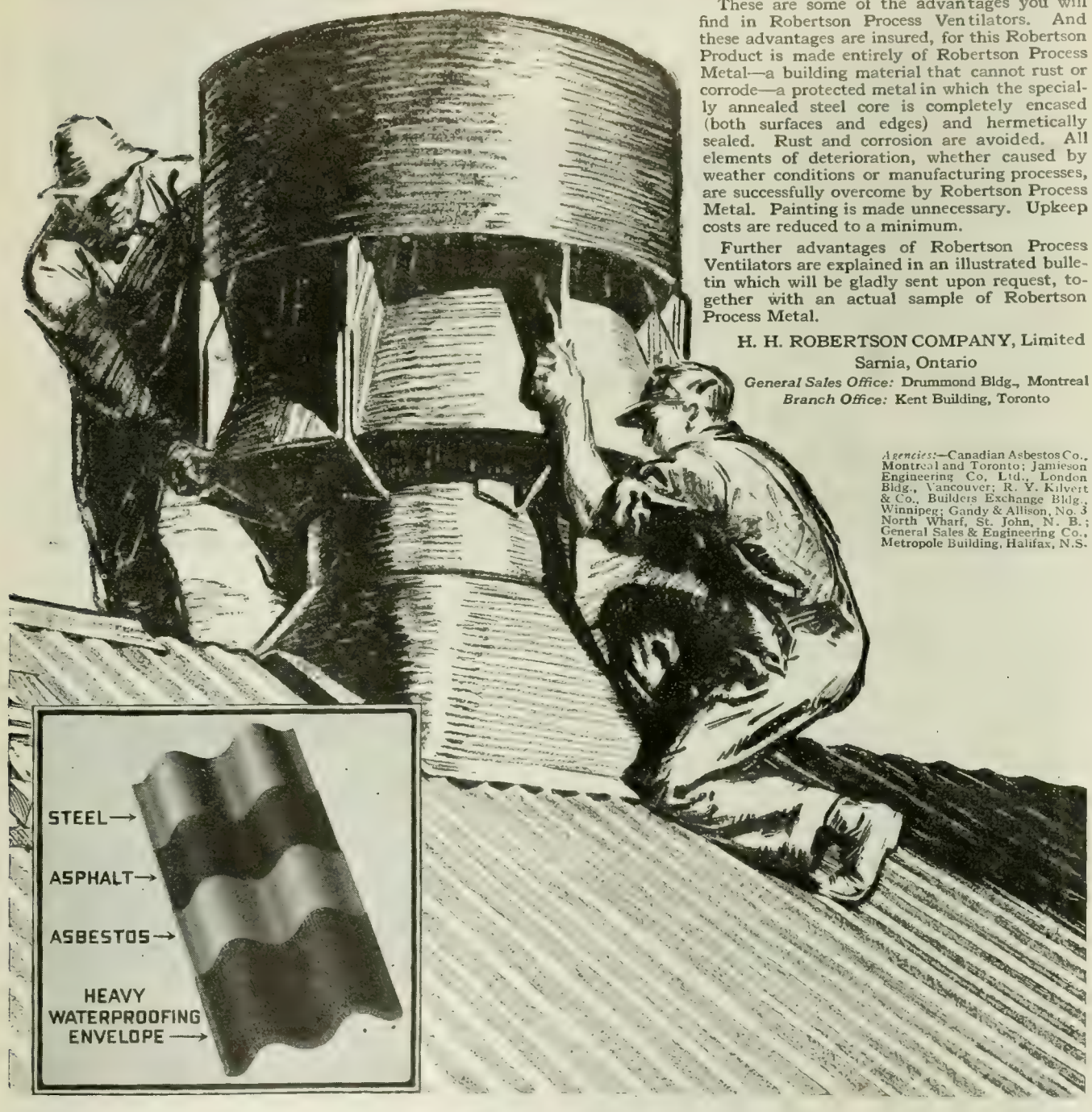
The air is drawn out of the building—Automatically! A partial vacuum is created. Back draft is impossible. Maximum ventilation is the result.

These are some of the advantages you will find in Robertson Process Ventilators. And these advantages are insured, for this Robertson Product is made entirely of Robertson Process Metal—a building material that cannot rust or corrode—a protected metal in which the specially annealed steel core is completely encased (both surfaces and edges) and hermetically sealed. Rust and corrosion are avoided. All elements of deterioration, whether caused by weather conditions or manufacturing processes, are successfully overcome by Robertson Process Metal. Painting is made unnecessary. Upkeep costs are reduced to a minimum.

Further advantages of Robertson Process Ventilators are explained in an illustrated bulletin which will be gladly sent upon request, together with an actual sample of Robertson Process Metal.

H. H. ROBERTSON COMPANY, Limited
Sarnia, Ontario
General Sales Office: Drummond Bldg., Montreal
Branch Office: Kent Building, Toronto

Agencies:—Canadian Asbestos Co., Montreal and Toronto; Jamieson Engineering Co, Ltd., London Bldg., Vancouver; R. Y. Kilvert & Co., Builders Exchange Bldg., Winnipeg; Gandy & Allison, No. 3 North Wharf, St. John, N. B.; General Sales & Engineering Co., Metropole Building, Halifax, N.S.

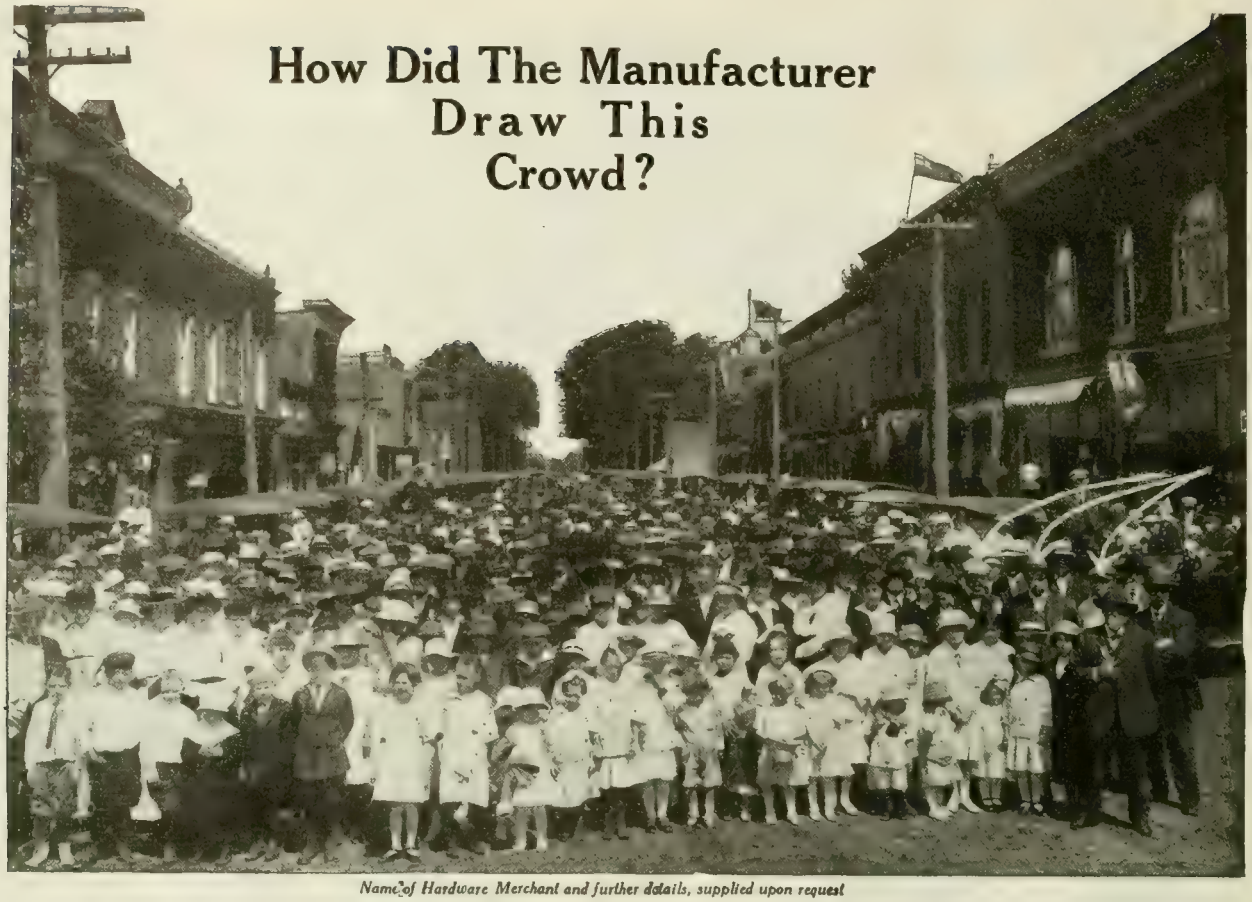


ROBERTSON PROCESS

TRADE MARK REG U S PAT OFF

METAL FOR ROOFING AND SIDING

How Did The Manufacturer Draw This Crowd?



Name of Hardware Merchant and further details, supplied upon request

The Answer is—He Didn't!

THE crowd was drawn by a hardware firm in an Ontario town of 700 population. This crowd of over 1,000 people represents customers of the store, drawn from miles around, to attend the picnic given by this firm to its customers. Surely this is evidence of the close relationship between this hardware firm and its customers.

The close relationship between retailer and customer in this instance is typical of conditions existing in hundreds of Canadian towns, villages and cities.

The average hardware merchant (particularly in the smaller cities and towns) has been established for many years. He has a big business connection built up through years of efficient service to his customers. He is well rated, and a desirable man with whom to do business. He influences the buying habits of the people in his community, and in over 90% of the sales made, he is the deciding factor.

"Which one do you recommend?" is a question asked thousands of times each day in the hardware stores of Canada.

If you can get the effort and enthusiasm of the retail hardware merchants and their clerks, plus their window and interior displays and local advertising behind your goods, you will have secured the co-operation of one of the greatest available selling forces.

HARDWARE AND METAL is paid for, and read, by all the wholesale hardware buyers of Canada, and over 90% of the retailers from coast to coast. They are the men who control the sale of your products to the hardware consumers. HARDWARE AND METAL can put your story before, practically, the entire Canadian hardware trade. One of our representatives would be glad to give further details.

(Only hardware paper in Canada with membership in the Audit Bureau of Circulations).

HARDWARE & METAL

Canada's National Hardware Weekly since 1888

143-153 University Avenue - - Toronto, Canada

Published every Saturday since 1888. The only weekly hardware paper in Canada, and the only hardware paper in Canada that gives you a circulation statement audited by the Audit Bureau of Circulations

Montreal Branch Southam Building **Winnipeg Branch, Union Trust Building**

No. 3

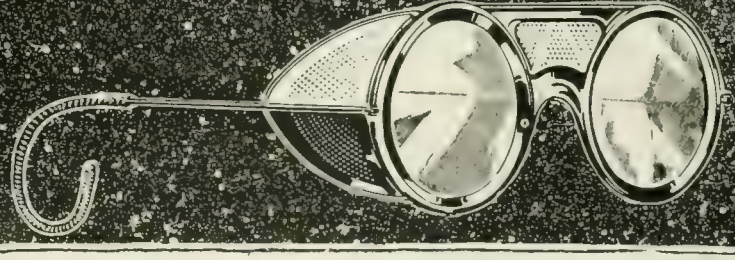
They've made false teeth you can eat with, false arms you can work with, false legs you can walk with—but nobody ever made a false eye you could see with!

Wear Your Goggles!

This is No. 3 of a series of short paragraphs which is appearing regularly in our advertising. Permission is freely given Safety Engineers, Editors of Employees' Magazines and others to use this material as they wish. In addition we shall be glad to furnish these paragraphs in leaflet form, in any quantity, for insertion in pay envelopes or as posters for bulletin use.

Men Handling Molten Metal Need—STOCO SAFETY GOGGLES with "CELOGLAS" Shatter-Proof Lenses

PAT. DEC 12 1916



The extra between-the-eyes protection afforded by Stoco Safety Goggles will be especially appreciated by men facing the molten metal eye hazard. The man behind the ladle will also find the Stoco Safety Goggle unusually comfortable—a safety glass that may be worn all day—every day—without discomfort to the eyes or face.

The Safety Goggle
Price Each (F.O.B. Geneva, N.Y.)

With "Celoglas" Shatter-Proof Lenses.$1.15
With Optical Glass Lenses..... .90

Attractive Discounts for Quantity Orders.

Comfortable earbows or black elastic headbands at the same price.

Note—A sample Stoco Safety Goggle will be sent interested, responsible people on receipt of request on letterhead.

The Standard Optical Co. Geneva N.Y.

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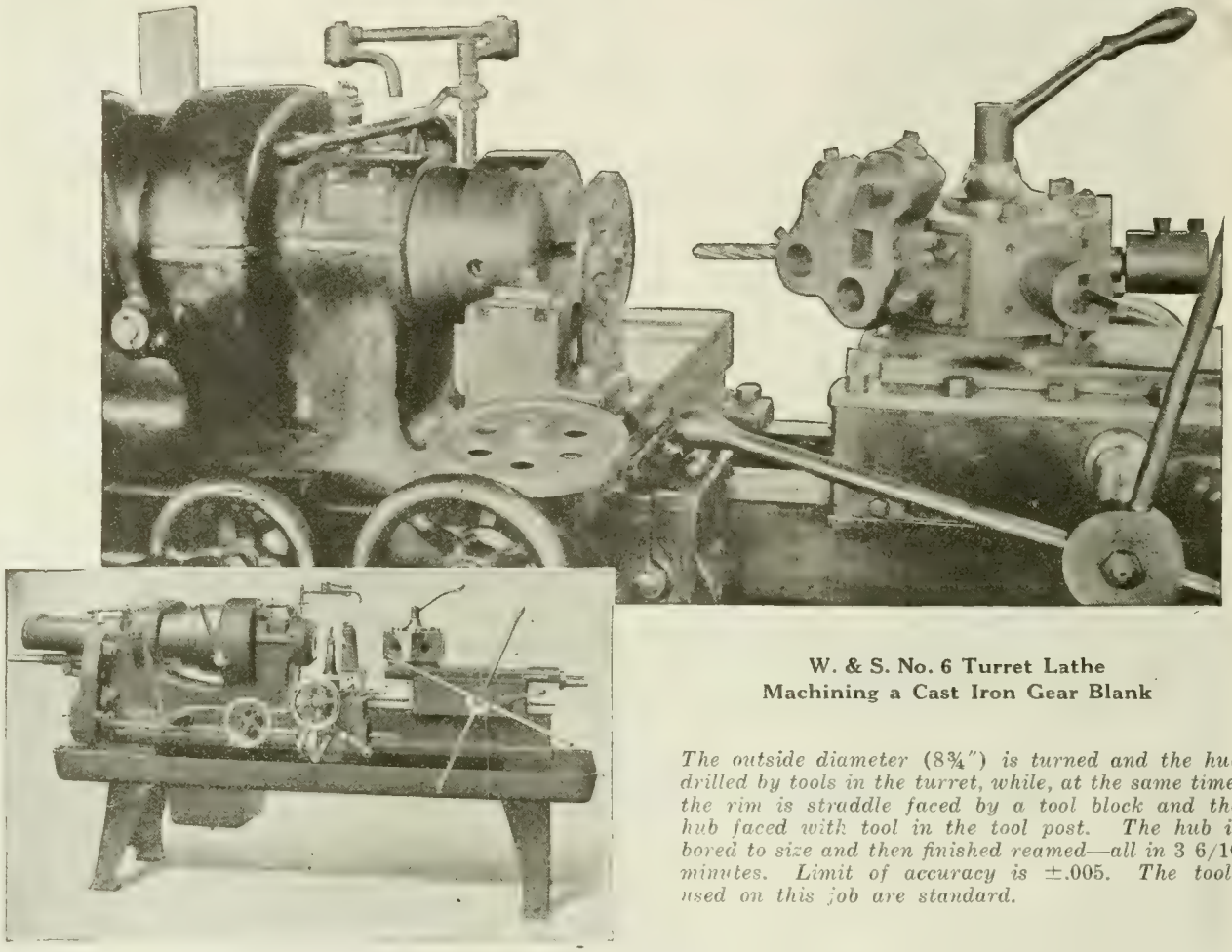
The Revival of Business is Sure



W. & S. No. 6 Turret Lathe
Machining a Cast Iron Gear Blank

The outside diameter (8¾") is turned and the hub drilled by tools in the turret, while, at the same time, the rim is straddle faced by a tool block and the hub faced with tool in the tool post. The hub is bored to size and then finished reamed—all in 3 6/10 minutes. Limit of accuracy is ±.005. The tools used on this job are standard.

Anticipate your needs for the Revival of Business. Be ready to compete in price and quality. Warner & Swasey Engineers are eager to help you. They will study the working cost of your turret lathe equipment and show you where and how this cost can be reduced if possible, thereby increasing the earning capacity of the equipment.

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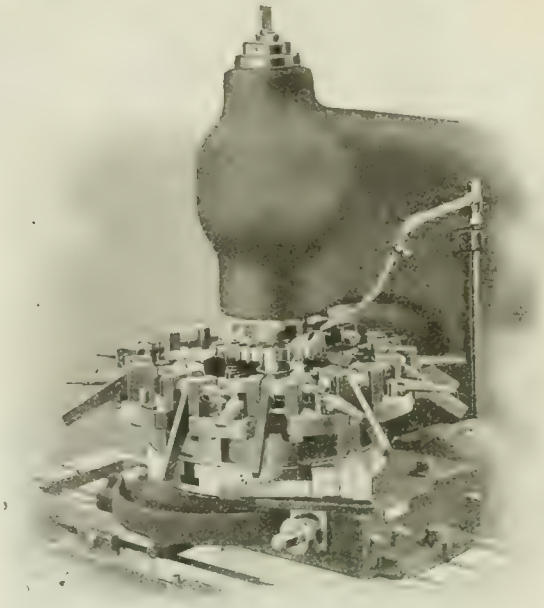
MILWAUKEE MILLING MACHINES



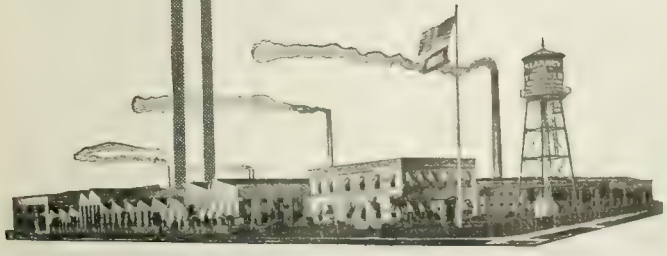
Continuous milling of 10-inch adjustable wrenches on a Milwaukee Vertical Milling Machine. These parts are turned out at the rate of 3,000 a day and the finished surface bears a constant and accurate relation to other selected points on the part.

Rapid, Economical Milling

Manufacturing milling by the continuous process is an advanced step in milling machine practice that is worthy of the serious consideration of the management of any plant. The motion in this milling process is continuous. It is reasonable, therefore, that in this way maximum production is secured. This sort of milling is most desirable in the machining of parts in large quantities. The rotary table with chucking fixture holding the work revolves, and the cutter is in operation and in the work at all times. The operator removes the finished piece and puts another unmilled one in its place.

Milwaukee Vertical Milling Machines are particularly well adapted to continuous milling. The spindle is adjustable for wear only as sufficient adjustment can be obtained by the adjustment of the knee alone, the same as it is in the horizontal type milling machines.

Have you any milling that would be well adapted to continuous milling? Let us help you.



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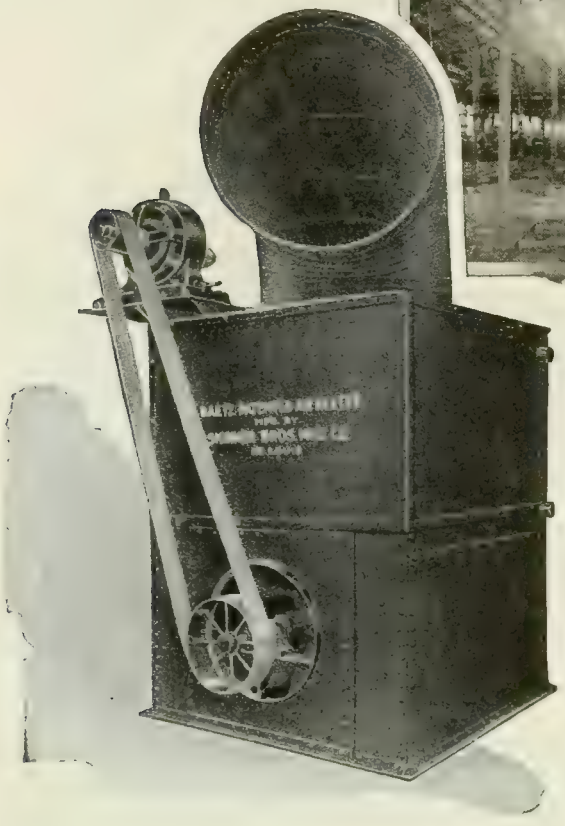
Showing installation of Skinner Bros. (Baetz Patent) Heaters in foundry of Best Foundry Co., Bedford, Ohio. Note extensive area served.



Heat Your Plant the Logical Way

Install the Skinner Bros. (Baetz Patent) Heating System and every corner of your plant will be kept at the same uniform, comfortable temperature, regardless of weather conditions. This is the logical method of heating — there are no places always too warm while others are too cold — no long, cumbersome pipe lines or air ducts.

The Skinner Bros. (Baetz Patent) Heater applies only natural laws and is simple and positive in action. It is portable; requires no special foundations; installation cost is 15% to 50% less than any other system, with equally low operating costs. Creates no drafts or air blasts, does not disturb floor dust and maintains comfortable, healthful working conditions always.

Performance guaranteed — if a Skinner Heater should ever fail, it would become immediately returnable to the factory and every cent of your money refunded.

Mechanical Details

Built as an individual enclosed unit with a series of pipe coils compactly mounted above a powerful fan-wheel. Coils are heated by exhaust or live steam. Cold air is drawn into the heater by the fan, impelled upward and around the coils, and, after being heated, is diffused through outlet hoods to every part of the open area. No pipes or ducts used. The fan is operated by any power available.

Direct-Fired Type

Where steam is not available, we supply our direct-fired type DF, which burns coal, coke or wood. Built on the same scientific principle as type SC. The fan is operated by any power available.

Send for Full Particulars

Find out more about this wonderful heating system—we will send complete details and list of users on request.

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Baetz Patent HEATING SYSTEM

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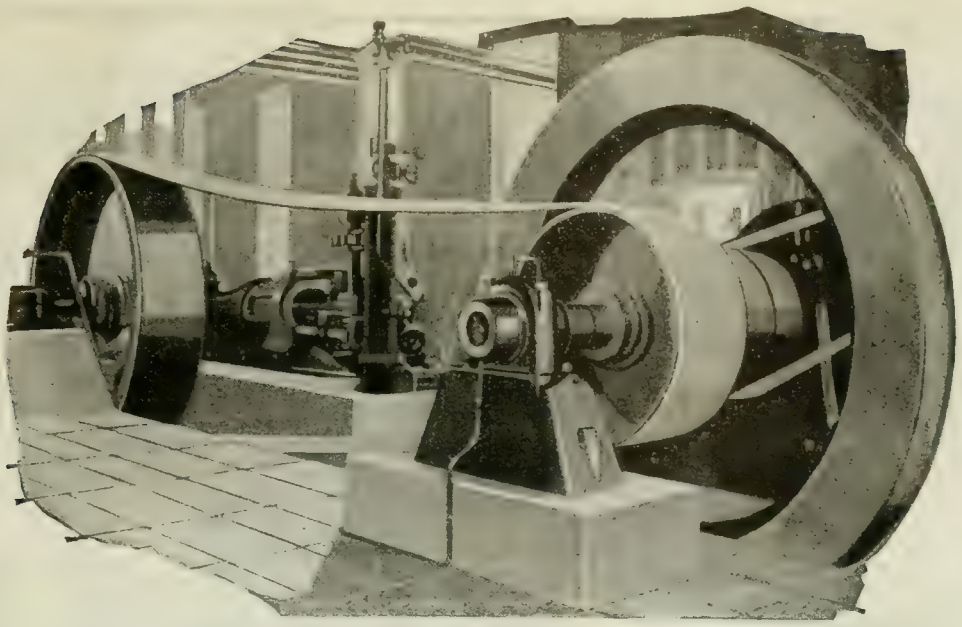

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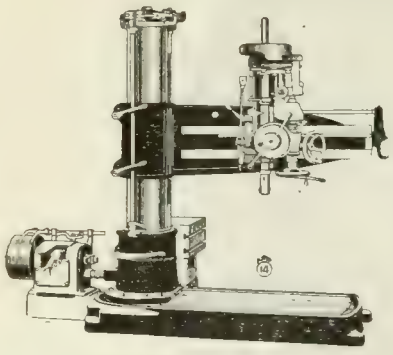

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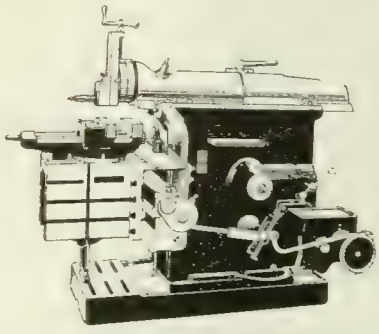

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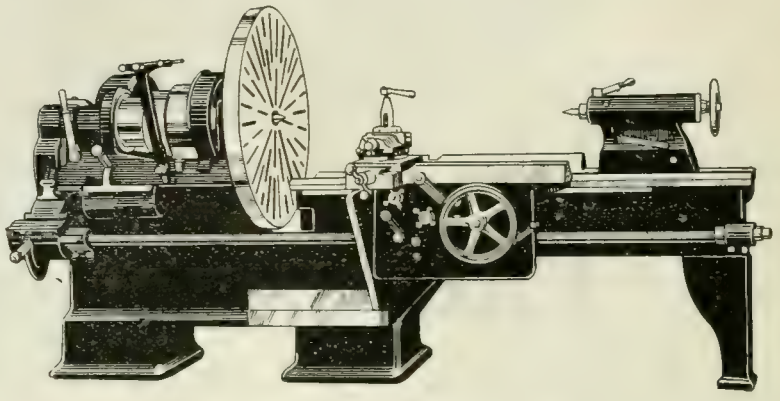

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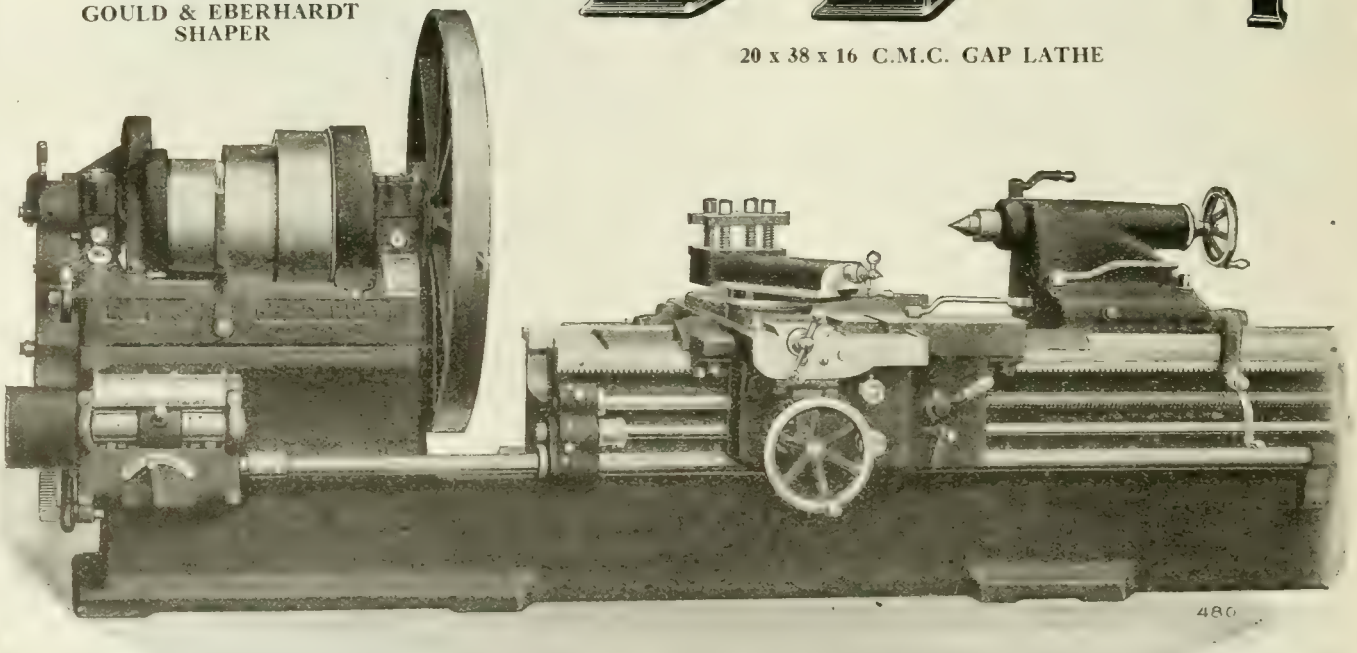

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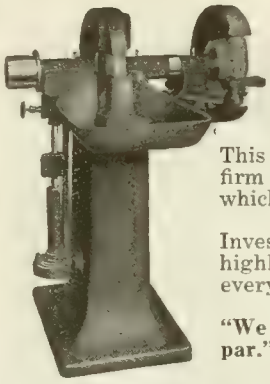

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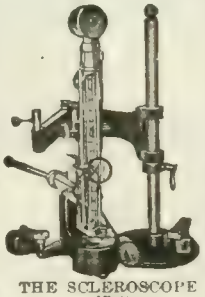

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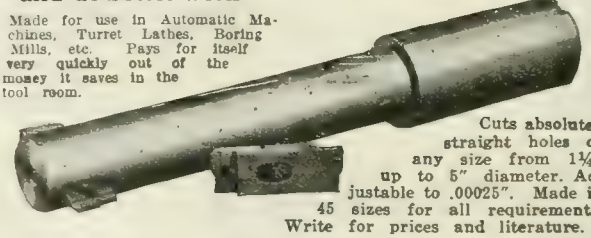

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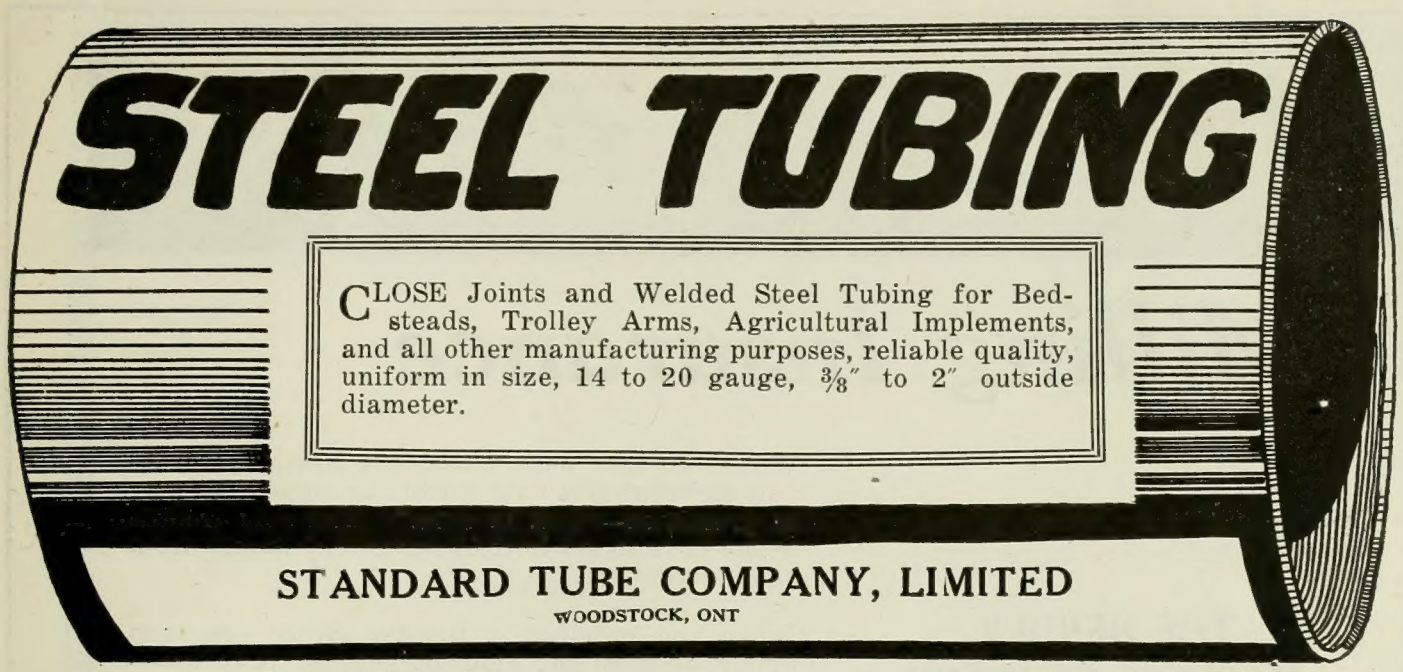
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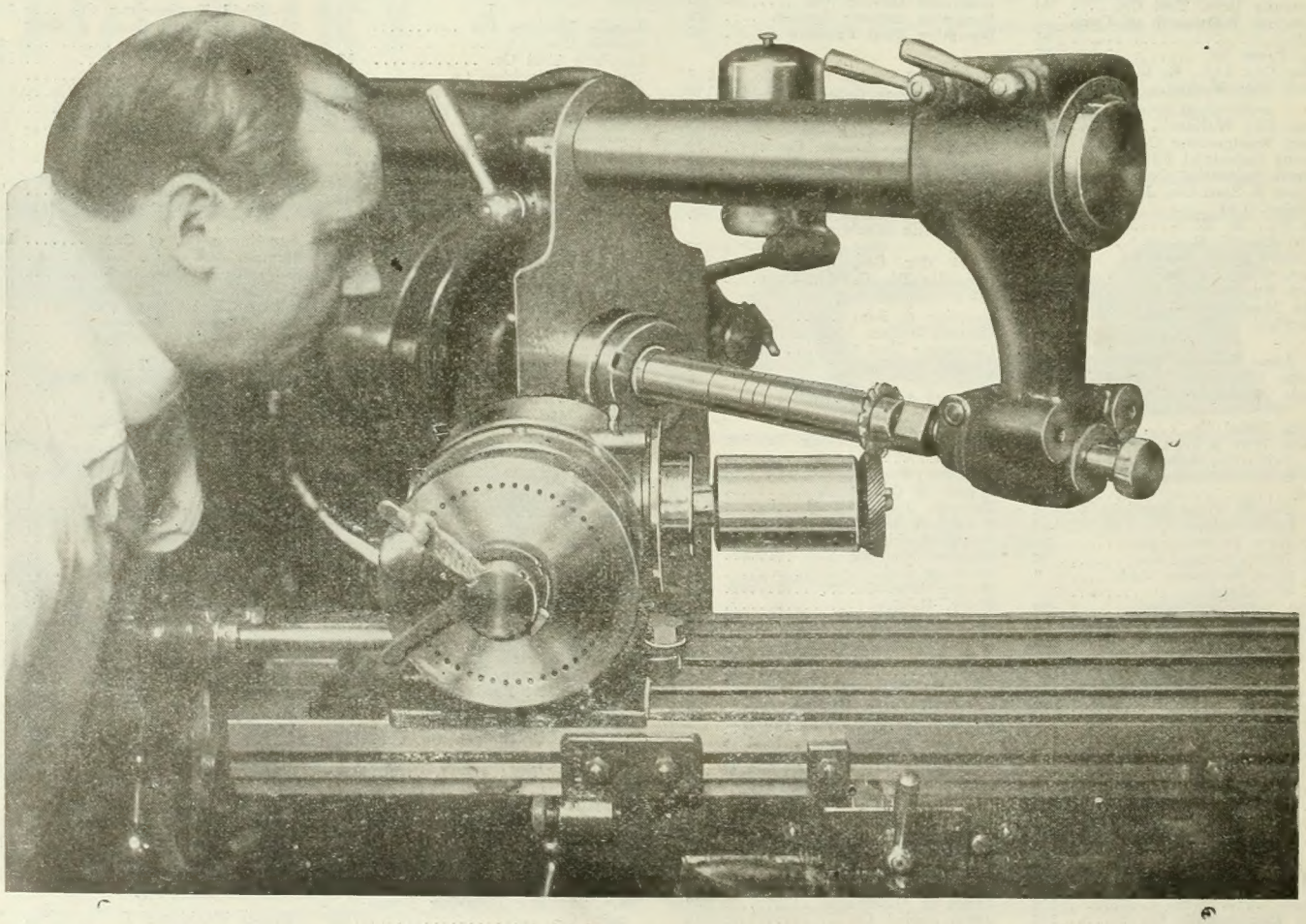

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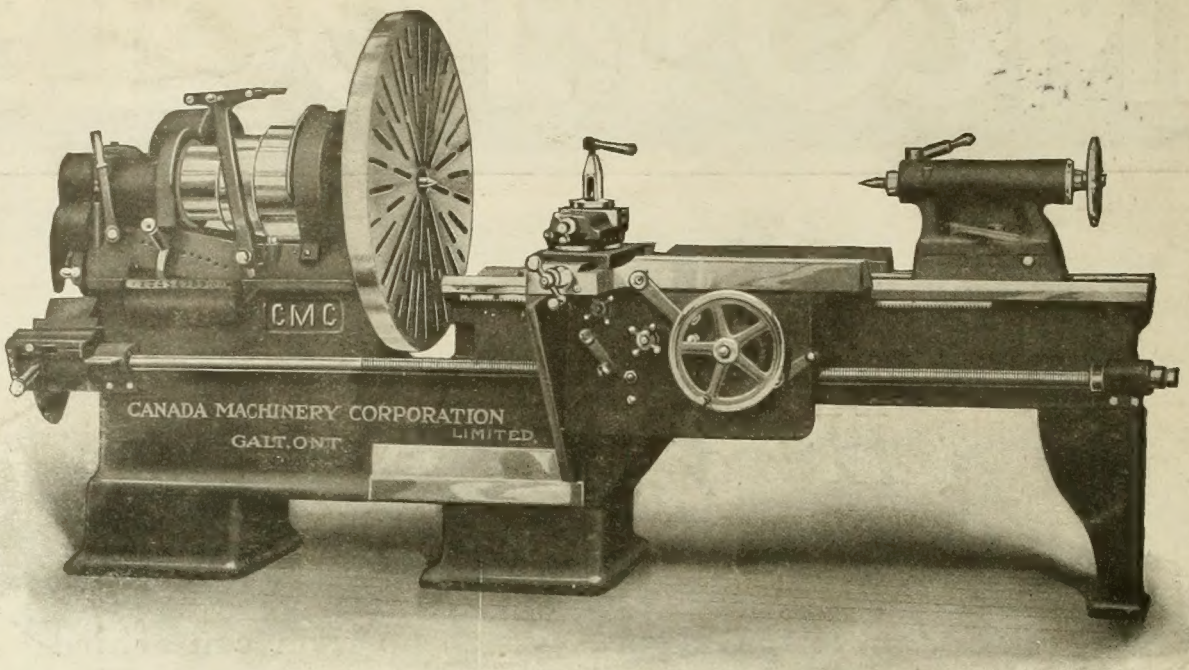

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